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USSR Peace Initiatives Reviewed

18010022a Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 8, Aug 87 (signed to press 6 Aug 87) pp3-6

[Lead article: "Politics of Reason and Realism"]

[Text] Soviet citizens and all progressive mankind are preparing to grandly celebrate the 70th anniversary of the Great October Socialist Revolution. The CPSU Central Committee Address "To the Soviet People" notes in connection with the upcoming October jubilee: "Our revolution is the most outstanding event of the 20th century and heralded the beginning of a new era in mankind's life. Time has deeply revealed its permanent importance and illuminated the gigantic opportunities which socialist social development is opening up."

October 1917 is especially noteworthy by the adoption of a historic foreign political document, the Peace Decree, by the 2d All-Russian Congress of Soviets of Workers' and Soldiers' Deputies. This document was prepared by V. I. Lenin, founder of the Communist Party and Soviet state, in the tumultuous, impetuous days of the Revolution and pursued a specific and acutely urgent objective of giving people peace. Later he described the triumph of the October Revolution as the "first victory in the job of doing away with war" ("Polnoye sobraniye sochineniye" [Complete Collected Works], Vol 44, p 149). From the moment of its origin Soviet Russia proclaimed peace as the supreme goal of its foreign policy, answering the aspirations both of its own people and of other peoples of the planet.

The 70 years which have passed since adoption of the Peace Decree vividly show that the creative potential it contained has fully preserved its significance even today. Moreover, many of its provisions have assumed special urgency in our days with the struggle that unfolded for new political thinking and for new approaches in international relations. Our foreign policy now is again being tested for firmness and consistency in the defense of peace and for flexibility and self-control under conditions of the feverish arms race being unfolded by imperialism and the international tension it is fanning. Lenin's ideas contribute to assertion of the socialist ideal: development of a general and indestructible peace on Earth, a world without wars and violence, a world of equitable cooperation of peoples for the welfare of mankind.

Development of the contemporary world is a complex, many-sided and dynamic process permeated through and through by opposing tendencies and full of the most diverse contradictions representing the source and motive force of social progress. We are preparing to celebrate the 70th anniversary of the October Revolution in a situation where our planet's future is being decided. Our planet can and must be rid of the threat of nuclear war. As stated at the 27th CPSU Congress, the campaign against the nuclear threat and the arms race and for preserving and strengthening universal peace remains the main direction of Soviet foreign policy. Our party's course has been consistently peaceable beginning with the origin of the Soviet Republic. We take a realistic, flexible approach to international problems, governed by the new political thinking.

The CPSU's international policy stems from the humane nature of a socialist society free of exploitation and oppression and having no classes or social groups interested in unleashing wars. This policy is inseparably linked with the party's fundamental, strategic domestic tasks and reflects the Soviet people's common desire to engage in creative labor and to live in friendship with all peoples.

Materials and documents of the 27th CPSU Congress formulated the following principal objectives and directions of CPSU international policy:

—Ensure favorable external conditions for protecting socialist society and advancing toward communism in the USSR; eliminate the threat of world war and attain universal security and disarmament;

—Steadily broaden and deepen the USSR's cooperation with fraternal socialist countries and assist in the strengthening and progress of the world system of socialism in every way;

—Develop equitable, friendly relations with liberated countries;

—Maintain and develop relations with capitalist states on the basis of peaceful coexistence and businesslike, mutually profitable cooperation;

—Have international solidarity with communist and revolutionary-democratic parties, the international working movement and the national liberation struggle of peoples.

Our party attaches paramount importance to the further development and strengthening of friendly ties, solidarity, firm comradely relations and cooperation between the Soviet Union and socialist countries. Such a policy is in the interests of each of the states of the peaceful socialist system and serves the cause of peace.

The CPSU is a component part of the international communist movement. It views its work of perfecting socialist society and advancing to communism as a most important international task. Accomplishing this task is in the interests of the peaceful socialist system, the international working class and all mankind.

A distinguishing feature of the present era is the entry of previously enslaved peoples onto the path of independence and a rise in their share in world politics and economics. The CPSU favors having the ever growing influence of tens of new states actively contribute to the cause of peace and social progress. The line toward an expansion of the USSR's ties with liberated countries is consistently implemented; the Soviet people have deep sympathy for their progressive aspirations. The Soviet Union is giving and will give assistance to peoples who are following the course of socialist orientation in economic and cultural construction, in the training of national cadres, in improving defensive capability, and in other areas.

The CPSU favors a deepening of relations with revolutionary-democratic parties. Particularly close cooperation formed with those parties which are striving to base their activities on scientific socialism. Our party favors developing ties with all national-progressive parties holding anti-imperialist and patriotic positions. The CPSU actively supports the just struggle by countries of Asia, Africa and Latin America against the oppression of transnational monopolies and for creation of a new international economic order and elimination of the bondage of debt imposed by imperialists.

The Communist Party firmly and consistently defends the Leninist principle of peaceful coexistence of states with different social systems. That is the fundamental basis on which the Soviet Union builds its relations with capitalist countries. They are legislatively fixed in the USSR Constitution.

We favor normal, stable relations with the United States of America which presume nonintervention in internal affairs, respect for each other's lawful interests, recognition and actual implementation of the principle of equality and equal security, and establishment of the greatest possible mutual trust on this basis. The CPSU believes that the politics of both powers must be oriented on mutual understanding and not on enmity, which carries the threat of catastrophic consequences for all mankind.

Our party attaches great importance to the further development of peaceful good-neighbor relations and cooperation of the states of Europe. The CPSU consistently strives to see that the process of strengthening security, trust and peaceful cooperation in Europe which began at the Soviet Union's initiative and with its active participation develops and deepens, taking in the entire world.

At a conference of the Political Consultative Committee in Berlin in May 1987 the USSR and its Warsaw Pact allies came out with a series of new initiatives with the objective of dismantling as quickly as possible the piles of all kinds of deadly weapons on the European continent, the most neuralgic region of the world. Conferees sounded a call for urgently concluding an agreement to eliminate all American and Soviet medium-range missiles in Europe on the basis of the fundamental agreement achieved at Reykjavik, simultaneously eliminate Soviet and American operational-tactical missiles in Europe, decide the question of tactical nuclear weapons including tactical missiles in Europe, agree on a radical reduction of strategic offensive arms with a simultaneous strengthening of the ABM Treaty terms, and reach an agreement on such a priority measure as a total nuclear test ban.

The Soviet Union and its allies are not attempting to achieve military superiority, but they also will never allow a disturbance of the military-strategic balance which has formed in the world arena. Meanwhile they are consistently striving to see that the level of this balance drops steadily and that the number of arms on both sides is reduced and the security of all peoples is fully assured.

Having thoroughly analyzed the international situation and with the objective of preventing a world nuclear war and saving civilization, the 27th CPSU Congress proposed creating an all-encompassing system of international security which bears a comprehensive, complex, constructive character.

The fundamental provisions of this system in the military area are the nuclear powers' renunciation both of nuclear as well as conventional war against each other or against third states; prevention of an arms race in space; cessation of all nuclear weapon tests and total elimination of nuclear weapons; a ban on and destruction of chemical weapons; renunciation of the creation of other weapons of mass annihilation; a strictly monitored reduction in levels of states' military potentials to limits of reasonable sufficiency; disbandment of military groupings and, as a step toward this, renunciation of the expansion and formation of new ones; and a reduction in military budgets.

In the political area the provisions include unconditional respect in international practice for the right of each people to sovereignly choose the paths and forms of their development; fair political settlement of international crises and regional conflicts; development of a set of measures aimed at strengthening trust among states and creating effective guarantees against an attack on them from without and for inviolability of their borders; and development of effective methods for preventing international terrorism, including safety in using international ground, air and sea lines of communication.

A distinguishing feature of the USSR's policy in the international arena is that its declarations are in inseparable unity with specific steps and actions aimed above all at the reduction and total elimination of weapons of mass destruction and on the whole at general disarmament and a strengthening of international security. The decision not to place antisatellite systems in space, the unilateral moratorium on all nuclear explosions which has lasted almost one and a half years, and the cessation of chemical weapon production can serve as proof of this.

The all-encompassing system of international security proposed by the Soviet Union is not limited to relations between the USSR and United States and between the Warsaw Pact Organization and NATO. It includes all regions and continents of the world. During meetings in Vladivostok, in a speech to Indian parliamentarians and in responses to questions of the Indonesian newspaper *Merdeka*, Comrade M. S. Gorbachev made a large number of suggestions aimed at including the Asiatic-Pacific Ocean region in the overall process of creating an all-encompassing system of international security. To settle one of the most tangled and explosive conflicts, that in the Near East, the USSR came out for taking collective steps within the framework of an international conference with the participation of all interested parties. Under conditions where the situation in the Persian Gulf has been sharply aggravated chiefly as a result of the provocative U.S. course, the Soviet Union proposed removing from there all warships not belonging to the given region.

The history of mankind knows many military-political alliances concluded among states, but never before was there one that played such a prominent role in preserving and strengthening the peace as the Warsaw Pact. This is a military-political alliance of a new type, an alliance of countries of the victorious proletariat.

States belonging to the Warsaw Pact, a defensive alliance of fraternal countries, advanced over one hundred initiatives aimed at reducing arms and strengthening universal peace. The military doctrine they adopted in May 1987 at a session of the Political Consultative Committee in Berlin bears a strictly defensive nature. In it the peaceable nature of the foreign policy of the Soviet Union and other countries of socialism and their constant readiness to offer a resolute rebuff to any aggressor are fused as one.

The Warsaw Pact member states solemnly declared that never under any circumstances will they begin military actions against any state or alliance of states whatsoever if they themselves are not an object of armed attack. They never will be first to employ nuclear weapons. They have no territorial claims on any state. They do not regard a single state or a single people as an enemy; to the contrary, they are ready to build relations with all countries without exception on the basis of mutual security and peaceful coexistence.

While the United States continues to place reliance on the force of arms and an expansion in the sphere of military rivalry including space, the USSR, guided by new thinking, is constructing its foreign policy so as to stop the arms race, eliminate the nuclear threat and normalize the situation. In the last two years we have come out with proposals on practically all questions of disarmament, but as a rule our peace initiatives meet either renunciation or the dogmatic affirmation of old positions.

The United States responded to the unilateral moratorium to which the USSR adhered for almost 18 months by stepping up explosions in Nevada. On 15 January 1986 we advanced a program for phased elimination of nuclear and other weapons of mass destruction by the end of the century. We were given the answer, however, that peace is entirely impossible without nuclear weapons and people again swore allegiance to the doctrine of "nuclear deterrence." How is NATO responding to our cessation of chemical weapon production? With new plans for creating and deploying binary weapons.

It was because of the USSR's position that a positive result of the Stockholm conference on confidence-building measures became possible. A meeting was held in Reykjavik at our suggestion, but it did not mark a historic turning point in questions of disarmament only because the United States did not wish to reject the preparation of "star wars" and the course toward military-strategic superiority over the Soviet Union.

At the request of the public, political figures and scientists, we agreed to break off medium range missiles from the Reykjavik "packet" and to eliminate operational-tactical missiles in Europe, but people in NATO who seemingly gave a positive response again are advancing demands which run counter to the principle of equal security.

In June 1986 Warsaw Pact countries proposed to NATO to begin a process of reducing conventional weapons and armed forces from the Atlantic to the Urals. In response the West began speaking of the need for NATO members to place greater funds into the production and improvement of conventional arms. In May 1987 Warsaw Pact participants invited NATO to discuss at a high level and compare the doctrines of both blocs and come to an agreement on precluding the military-technical possibility itself of an attack on each other. Instead of a distinct reply we again heard speculation concerning the alleged superiority of the Soviet Union in conventional arms. That is the situation. Those are the words and actions.

Under conditions of a constant military threat stemming from imperialism, the CPSU Central Committee and Soviet government are doing everything necessary to maintain the country's defense potential at a sufficiently

high level ensuring reliable security of the Soviet Motherland and its allies. The USSR Armed Forces now are one of the principal factors deterring aggressive aspirations of reactionary circles of imperialism.

At the January 1987 CPSU Central Committee Plenum the task of Army and Navy military cadres was worded as follows: "Act with supreme responsibility; elevate and improve the proficiency and combat readiness of all branches and combat arms." The Plenum emphasized that the Soviet people and our party are doing everything to strengthen the Armed Forces and that they have the right to assume that no aggressive forces will be able to catch us unawares.

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Military-Political Situation in Middle East and South Asia

18010022b Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 8, Aug 87 (signed to press 6 Aug 87) pp7-12

[Article by Col A. Gushev]

[Text] The region of the Middle East and South Asia including the territory of Iran, Democratic Republic of Afghanistan, Pakistan, India, Sri Lanka and Bangladesh as well as the water area of the Indian Ocean lately has been drawing increasingly fixed attention from the world public and from business, political and military circles. The complex and contradictory sociopolitical processes in many countries of this region, the status and development of interstate relations here, and the presence of a large number of diverse, acute and complex problems exerting a considerable influence on the make-up and character of the military-political situation both in individual countries and the region as well as in the world arena as a whole generate special interest.

In analyzing the Middle East situation, foreign specialists single out above all the Iran-Iraq war, development of political processes in Iran, and the unceasing wide-scale subversive activities by forces of international imperialism and the regional reaction against sovereign Afghanistan. In South Asia the build-up of Pakistan's military potential with the help of the United States and the provocative course of Islamabad authorities with respect to neighboring countries as well as activation of extremist and separatist groupings in India supported from outside are assuming increasingly dangerous proportions. Nevertheless, the most serious and most dangerous problem for peoples of this region of the world remains the militaristic, neocolonialist activity by ruling circles of the United States, and Pentagon militarists above all, for strengthening U.S. positions in the region and expanding intervention in internal affairs of the region's states.

Washington's desire to strengthen its influence here pursues global objectives, and the political, military and other efforts of the United States and its allies are subordinated to attaining those objectives. The principal one is to turn the territories of a number of countries of the Middle East and South Asia as well as the water area of the Indian Ocean into a Pentagon springboard for creating a threat to the Soviet Union from the south. With the objective of substantiating its aggressive plans and practical measures, the White House advanced the thesis that "vital strategic, economic and diplomatic interests of the United States meet" in this region. Five practical tasks were formulated to develop this thesis: preventing a growth in the Soviet Union's influence here, assuring the security of regimes friendly to Washington, maintaining regional stability, guaranteeing the western world's free access to Persian Gulf oil, and curbing "state terrorism."

It is easy to discern that behind the above tasks is the desire by U.S. ruling circles to prove to the world community the "vital need" of an American military presence in the region and justify in advance any Pentagon adventures in it. All this fully fits within the framework of the Reagan doctrine of "neoglobalism," a doctrine of international brigandage and violence. Under its cloak Washington is attempting to step up pressure on progressive regimes and movements in the region, get back the positions in Iran which the United States lost in the late 1970's, overthrow Afghanistan's legitimate government, expand and deepen military and political cooperation with Pakistan, destabilize the situation in India and shove that country from an anti-imperialist course, and turn this region into a zone of undivided U.S. influence. Therefore not one of the important military-political problems of the region can be examined in isolation from practical U.S. politics, which is the principal destabilizing factor of the situation in the region.

The **war between Iran and Iraq**, which has lasted around seven years, is among the most dangerous sources of tension and military-political instability in the Middle East. Alarming information about heavy mutual losses in personnel and equipment, unceasing bombardments and missile and artillery fire against cities and various civilian targets which are doing great damage to the populace and economy of both countries continues to come from areas of combat being conducted on an almost 1,000 km front along the Iran-Iraq border. The flame of war is encompassing the Persian Gulf zone more and more, creating a direct threat to international shipping. It has turned into the largest armed conflict in the world in scale after the American aggression in Vietnam. According to the data of foreign sources, up to 1.5 million personnel of the regular troops and irregular formations, over 60 divisions, some 5,000 tanks and around 1,000 warplanes now are taking part in the combat. During this war the sides have lost over one million persons killed and hundreds of warplanes, tanks and other military equipment. The economic damage to both countries is assessed at more than $500 billion.

Efforts being made by various states and international organizations including the United Nations to stop this senseless war are being blocked by Iran's ruling circles, who are counting on bringing it "to a victorious conclusion." Foreign specialists explain such an uncompromising line of the Teheran leadership by several motives. First of all, the highest circles of the Iranian ruling clergy still look on the war against Iraq as a means of rallying the populace and diverting its attention from domestic difficulties. Secondly, Teheran connects the war's continuation with realization of the policy developed here of exporting the "Islamic revolution" to neighboring and other Muslim countries, including Iraq. It is a question of attempts by Iran's shiite leaders to use the armed conflict for resolving in its favor the many centuries of religious rivalry between shiism, which holds Iran's Muslims as well as a portion of the Muslim populace of Iraq, Afghanistan and Arab states of the Arabian Peninsula under its influence, and sunnism, the most influential current in Islam which has been established in a majority of Arab and other Muslim states. But for Iran's ruling circles a continuation of the war against Iraq has not only and not so much a religious aspect: Teheran does not conceal the fact that victory would give it an opportunity to create a kind of shiite empire of Iran and Iraq which could dictate its terms to remaining countries of the region. Thirdly, the uncompromising nature of the Teheran leaders also is largely connected with the fact that it is easier to conduct a struggle against antiregime sentiments and the opposition in a wartime atmosphere. With respect to the Iraqi side, it expresses readiness to undertake a cessation of combat actions and begin talks with Iran.

Meanwhile it must be taken into account that the fratricidal war between two Muslim peoples already could have stopped had there not been forces in the world interested in its continuation. The nature of this "interest" lies in the neocolonialist, imperialist essence of the politics of a number of western countries and Israel, which are attempting to draw economic and military-political advantages from the bloody conflict between Iran and Iraq. This includes a deepening of the split in the anti-imperialist movement, weapon deliveries to the belligerents, their mutual weakening in the interests of subsequent enslavement, exaggeration of real and imaginary dangers for Arab countries of the region for purposes of imposing military assistance on them, and so on.

These trends show up especially vividly in military-political maneuvers of the Reagan administration around the Iran-Iraq war. Having taken a position of demonstrative "neutrality" toward it from the very beginning, Washington in fact never ceased efforts to deepen the contradictions between Iran and Iraq and between Iran and Arab states on the Arabian Peninsula. There are well mastered techniques in the arsenal of weapons it is using: spreading purposeful misinformation through CIA, State Department and press channels; making periodic instigative declarations through official administration representatives; whipping up "fears" among monarchic regimes of the Persian Gulf; and manipulating arms deliveries for the belligerents so as not to give one of them an appreciable advantage over the other and thus help drag out the armed conflict.

At a press conference in December 1985 U.S. Secretary of State Schultz convinced press representatives that in the interests of stopping the war his country would attempt to erect a barrier in the path of military deliveries to Iran. At this time the highest administrative representatives already were working out plans to organize the secret sale of arms and military equipment to Teheran, figuring on receiving the good will of the ruling clergy and a gradual leveling off and restoration of Iranian-American relations. The scandal which arose as a result of the exposure of this entire affair and which was given the name "Irangate" serves as yet further confirmation of the fact that on behalf of its selfish interests the United States is ready to resort to any dirty maneuvers, even those running counter to its officially proclaimed political line. The adventurism and danger of such an approach to resolving foreign policy problems are fully obvious, since they promote a further escalation of the war between Iran and Iraq and create conditions for drawing other states into it in one form or another. The probability of such a development of events finds confirmation in instances of more frequent attacks by the belligerents on civilian vessels and warships of various states in Persian Gulf waters, in Iran's threats to blockade the Gulf of Hormuz, and in the West's attempt to continue to use the conflict to impose its military assistance and "protection" on other countries of the region.

As a result a serious threat to international shipping has been created in the Persian Gulf, an area with extremely crowded sea lanes. Over 300 foreign vessels including American and Soviet vessels have been fired on or have struck mines, but Washington continues to use the area's aggravated situation to build up its military presence. And the escort of Kuwaiti tankers flying the American flag by U.S. Navy warships and aircraft which began on 22 July of this year at the decision of the White House appears especially provocative. All this aggravates the already explosive atmosphere in the gulf.

A most rapid cessation of the fratricidal war and resolution of issues by political means would be in the interests of peoples of the region, and Iranian and Iraqi peoples above all. It is common knowledge that the Soviet Union adheres to this position; it has repeatedly come out in favor of establishing peace in the region. The latest UN Security Council resolutions also call for a peaceful settlement between Iran and Iraq.

With respect to the military aspect of the Iran-Iraq conflict, foreign experts believe that the correlation of forces between the two countries in the near future hardly will permit either one of them to achieve decisive successes at the front. Iraq continues to surpass its

enemy in number and quality of arms and is generally successful in repelling attempts by Iranian troops to shift military actions into the interior of Iraqi territory. Iran for its part is attempting to take advantage of superiority over Iraq in numerical strength of the armed forces. To this end the Iranian command attempts to preserve high troop activity in various sectors of the front without regard for human losses, thus counting on winning a "war of attrition." Teheran's support of antigovernment groupings of Iraqi Kurds and the shiite opposition in Iraq also serves this same objective.

The **build-up of domestic political instability in Iran** is another important problem closely linked with the Iran-Iraq war and playing an increasingly appreciable role in the process of shaping the situation in the Middle East. The country's enormous losses during the war years, the breakdown of the economy, the unsettled nature of social-economic problems and the repressive nature of methods of government led to a situation where mistrust is growing among the population as to the ability and desire of ruling circles to direct society's life into a normal channel. Foreign observers note the Iranians' obvious drop in interest toward slogans of the ruling clergy. Antiwar sentiments are strengthening. All this is manifested in the form of demonstrations and strikes, in attempts by many Iranians to avoid being sent to the front, in stepped-up activities of the organized political opposition to the regime, and in an expansion of antigovernment armed struggle in Iranian Kurdistan and Baluchistan. The external opposition (both leftist and rightist, including the promonarchist opposition linked with the family of the former shah) also attempts to take advantage of the aggravation of the domestic political situation. Contradictions and rivalry among the ruling clergy are growing and an invisible but very fierce struggle for power has begun among various groupings of the clergy.

The West (and the United States above all) is jealously following the events occurring in this state and is trying not to miss a convenient moment for actively intervening in them with the objective of restoring its past influence in Iran, which it regards as the key country of the region. Even now numerous pieces of evidence are coming from various foreign sources that, considering their past sorry experience, Washington and its allies are attempting to enter into contact with any Iranian opposition groupings in order to place the development of domestic political events under their control.

The **armed intervention into internal affairs of the DRA from outside** is the most acute and pressing military-political problem of the region in this stage. The republic remains not only the object of fierce attacks by forces of the counterrevolution, but also the arena of a wide undeclared war on the part of the United States, Great Britain, Pakistan and Iran as well as other states of the West and reactionary Muslim regimes. They have set the objective of destroying achievements of the 1978 April Revolution, overthrowing the legitimate government and bringing to power forces welcome to the West and the regional reaction in the person of former exploiting elements, Muslim extremists and western agents. Reasons for the insistence with which instigators of the undeclared war against the DRA are attempting to achieve their objectives lie not only in their desire to do away with a disagreeable system, but also in proving to peoples of the region the immutability and strength of traditional principles of the East and the impossibility of introducing any kind of fundamental changes to the order of things existing over centuries. Actions being taken by U.S. imperialism and its accomplices with respect to Afghanistan can be regarded in no way other than as a frontal attack against the progressive improvement which has begun to show in the sociopolitical life of peoples of developing states. The basis for this plot of pro-imperialist circles is antisovietism and (in addition to waging an armed struggle against the DRA) the desire by Washington and its wards to discredit the Soviet Union's international assistance to friendly Afghanistan, set the USSR off against other states of the Middle East and South Asia, and undermine trust in the world of socialism in peoples struggling for their national liberation.

Being the principal instigator and organizer of the undeclared war against the DRA, Washington is making the chief contribution to the job of supporting counterrevolutionary Afghan bands with arms. American instructors are directly involved in training the dushman at training centers on Pakistani territory and in planning armed actions. The scope of American financial support to the Afghan counterrevolution is constantly growing. While it was $150 million in 1984, it was over $480 million in 1985 and $550 million in 1986. Some $630 million is being allocated for 1987. Modern weapons including portable Stinger ZRK [SAM systems], rapid-fire antiaircraft guns, communications and mining equipment as well as other materiel are arriving in ever growing amounts through Pentagon and CIA channels to arm the bands. Washington is taking active steps to move the counterrevolution into the international arena and give it recognition as a "legitimate" representative of the Afghan people. The objectives being pursued are to legalize intervention in DRA affairs and give the counterrevolution the capability of continuing this fight against democratic Afghanistan not only by armed means, but also political means.

The scale of intervention in DRA affairs on the part of other countries also is not being reduced. For example, representatives of special services and military departments of France, the FRG, Egypt, Saudi Arabia and certain other states continue to conduct training for the dushman in Pakistan. Anti-Afghan actions have been stepped up on the part of the Iranian ruling clergy, which views Afghanistan (just as it does Iraq) as a priority target for its policy of exporting the "Islamic revolution." Each year up to 30,000 rebels undergo training on Iranian territory.

Pakistan remains the principal base of the Afghan counterrevolution. There are more than 100 bandit training centers and stations, the headquarters and support bases of the main counterrevolutionary groupings, and weapon and ammunition depots and transshipment bases on its territory. The Pakistani regime is trying to drag out the existing situation as long as possible, which allows it to go to Washington with new requests for American arms deliveries. Official Islamabad authorities continue to refrain from recognizing the legitimate DRA government and take a very unconstructive position on indirect talks on matters of settling the situation around this sovereign state. Moreover, lately they have been clearly stiffening the anti-Afghan course and resorting to direct military provocations against their northern neighbor. The line of conduct of the Zia-ul-Haq administration indicates the desire to use any means to eliminate the democratic regime in Afghanistan and turn this country into a subservient satellite of the United States, Pakistan and the regional reaction.

Afghanistan now is at an important historical stage: the country is continuing to implement the program of national reconciliation announced in late 1986 with its objective being to put an end to the fratricide, give the people the desired peace, and return to their homes and peaceful labor those Afghans who were drawn into the struggle for a cause alien to them as a result of deception or coercion or who left the country and are in a refugee status in Pakistan, Iran and other countries. The policy of national reconciliation already has produced positive results. At the same time, its effectiveness could be enormously higher had it not encountered fierce resistance on the part of the counterrevolution and its protectors.

The **process of widening American-Pakistani military and political cooperation** is having an appreciable destabilizing effect on the military-political situation in the region in question. It is common knowledge that Pakistan long ago turned into one of the principal recipients of American military and economic aid. Over the last five years weapons and military equipment worth some $3.2 billion have been delivered to it from the United States, including 40 F-16 aircraft, 200 M48A5 tanks, 179 155-mm and 203.2-mm self-propelled and towed howitzers, 20 AH-1S Cobra-TOW fire support helicopters, 75 M113 APC's, TOW antitank missile systems, Harpoon antiship missiles and other arms. Over the next six-year period the Reagan administration will provide the Zia-ul-Haq regime with military-economic aid amounting to over $4 billion, as part of which Islamabad sent Washington a request for a new shipment of F-16 aircraft, field artillery pieces, multiple-launch rocket systems, APC's, Stinger SAM systems, guided missiles and other arms. An agreement already has been reached between the United States and Pakistan about U.S. warships and aircraft using Pakistani ports and airfields and about modernizing (with the participation of American specialists) a number of naval bases, ports and airfields on the Makran coast of the Arabian Sea, as well as the air defense system in areas bordering on the DRA. The question of the possibility of Washington giving the Zia-ul-Haq regime E-3A AWACS aircraft or E-2C Hawkeye aircraft has been causing special alarm of late in countries bordering on Pakistan. Pakistan's receipt of these aircraft will signify that a qualitatively new phase has begun in Pakistani-American cooperation leading to legitimization of the American military presence in the Middle East.

By granting Islamabad military-economic assistance, giving it political support in the international arena and helping to raise the combat capabilities of its armed forces, the United States clearly is attempting to create conditions for turning the Zia-ul-Haq regime into a subservient executor of U.S. hegemonic plans in the region.

The military-political situation remains tense **in India.** The Indian leadership is faced with serious and very complex tasks such as ensuring the country's stable economic development, raising the population's standard of living, and eliminating the causes of international enmity and religious-communal and caste contradictions. A base for the actions of nationalist and separatist forces continues to exist in the states of Punjab, Jammu and Kashmir, and in India's North East regions. Sikh extremist groupings in Punjab which are continuing to struggle with support from abroad (above all from Pakistan) to establish Halistan, an independent sikh state, represent the greatest threat to stability of the situation in the country.

The situation not only in India itself but also in South Asia as a whole will depend largely on a solution to all these problems. India's enormous potential on a regional scale (780 million persons) and its high international authority as a leader of the Nonaligned Movement in the given stage are important stabilizing factors of the situation in South Asia.

The military-political situation **in Bangladesh and Sri Lanka** also is rather complex. Both states are encountering serious economic difficulties, which they are incapable of resolving without foreign assistance. In addition, the West's attempt to take advantage of difficulties of the Sri Lankan and Bangladesh governments in order to step up pressure on them by granting economic and military aid is having a substantial effect on the situation in those countries. The problem of mutual relations between Sinhalese and Tamils, the principal nationalities of Sri Lanka, has assumed special acuteness in this state of late. Despite continuing attempts to find ways for a political settlement of the national crisis with India's mediation, a real danger of new escalation of fighting between government troops and combat formations of Tamil extremists continues in the country.

The **American military presence in the Indian Ocean zone,** activities in the region by the unified U.S. Armed Forces Central Command (CENTCOM), and the arms

race unleashed by the United States in this region of the world also represent a factor of constant negative influence on the military-political situation in the Middle East and South Asia. A U.S. Navy grouping consisting of approximately 15 warships headed by an attack carrier is in this ocean's waters practically constantly. A store of weapons, military equipment and ammunition for a contingent of the interventionist Rapid Deployment Force (planned to be moved to the region in case a "threat" to American interests arises here) is kept in full readiness aboard depot ships deployed in the vicinity of Diego Garcia Atoll. Aircraft of U.S. strategic aviation, AWACS and land-based patrol aircraft are conducting measures to develop the Indian Ocean zone and observe activities of armed forces of the region's countries. All this is under the false pretext of a "defense of peace," ensuring "reliable access" to sources of oil, countering "state terrorism" and so on. What is in fact apparent is a strengthening of U.S. military positions in the Indian Ocean, giving Washington opportunities to exert necessary influence on the atmosphere in the given region.

It is common knowledge that for many years the United States and its allies have been disrupting both talks on turning the Indian Ocean into a peace zone as well as an international conference on the Indian Ocean. In order to shift the matter from dead center, the USSR expressed readiness to begin talks with the United States and other noncoastal states at any time on a substantial reduction in size and activities of naval forces in the Indian Ocean, as well as to work out international guarantees for the security of sea lanes. The meaning of the Soviet proposal is to do everything possible even now without awaiting the conference in order to relax tension in this part of the globe and thus create conditions for holding the conference. The aggressive nature of politics of American imperialism, which is relying on a preservation of tension undermining political stability in the Middle East and South Asia, becomes even more obvious against the background of the Soviet Union's open and honest peaceful course aimed at the welfare of Asiatic countries.

6904

U.S. Patriot Air Defense Missile System

18010022c Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 8, Aug 87 (signed to press 6 Aug 87) pp 23-29

[Article by Lt Col A. Tolin, candidate of military sciences]

[Text] Along with financing the development of offensive weapons as it continues to intensify the arms race, the Pentagon lately has been giving more and more attention to perfecting air defense, modernizing existing systems and weapons for combating airborne targets, and creating new ones. In the opinion of foreign military experts, the Patriot air defense missile system which became operational in 1982 will play an important role in the air defense of U.S. ground forces and in NATO's joint air defense system in Europe.

Development of the Patriot air defense missile system (Raytheon was the prime contractor) went on for one and a half decades and its cost exceeded $2.3 billion. According to western press assessments, including the above sum the expenditures for acquiring 103 units of fire (batteries) and 6,200 surface-to-air guided missiles by 1992 will be around $12 billion. In the opinion of foreign specialists, such considerable appropriations are explained above all by the great complexity of the Patriot air defense missile system caused by a desire to achieve a high level of performance characteristics. It is believed that these expenditures will be compensated to a certain extent by reduced expenditures for personnel pay and allowances and logistical support throughout the entire period of operation. For example, the numerical strength of personnel in a Patriot air defense battalion was reduced to 765, while it is 878 and 1,030 persons respectively for battalions equipped with the Improved Hawk medium range air defense missile system and Nike Hercules long range air defense missile systems. The troubleshooting process has been automated, the products list of spare parts has been reduced to 1,928 items (compared with 4,398 and 13,230 items for the aforementioned air defense missile systems), and the amount of periodic technical servicing has been reduced in the Patriot system.

The Patriot air defense missile system is capable of bringing up to nine targets under fire simultaneously, conducting fire under conditions of a wide use of electronic warfare resources, and engaging supersonic airborne targets at ranges up to 70 km and at altitudes up to 24 km. American specialists believe that because a number of new engineering solutions were realized in creating the system it will surpass existing medium and long range air defense missile systems by fourfold in fire capabilities and tenfold in resistance to jamming.

The Patriot air defense missile system includes a multifunction radar, control station, surface-to-air guided missiles in shipping and firing canisters, launchers (up to eight), power supply plant, communications equipment and auxiliary operating equipment.

The **AN/MPQ-53 multifunction radar** (Fig. 1 [figure not reproduced]) is designed for acquisition, identification, tracking and illumination of targets and for tracking the missiles, receiving data from their on-board guidance equipment, and transmitting commands to the surface-to-air guided missile. The radar is capable of detecting airborne targets at ranges up to 150 km, tracking up to 100 targets and issuing the data needed for simultaneous engagement of nine of them.

The principal radar components are an antenna system, transmitter, receiver, digital processor, control unit, tracking equipment, and identification-friend-or-foe [IFF] equipment.

The radar equipment (with the exception of the antenna system and the super high frequency [SHF] devices of the transmitter and receiver) is housed within a container-type hut and protected against the effect of the electromagnetic pulse of a nuclear explosion, thunderstorm discharges and electromagnetic interference. The hut is mounted on a two-axle semitrailer transported by the M818 wheeled (6x6) prime mover. The prime mover with trailer is 15 m long, 2.9 m wide, 3.6 m high and they weigh around 30 tons.

When deployed at a selected position (it must not exceed 10 degrees of slope) the radar is levelled by hydraulic jacks. For the radar's operation in a designated sector its hut is rotated in the necessary direction relative to the semitrailer bed. With a fixed hut position the radar is capable of acquiring a target in a sector up to 90 degrees azimuth and of guiding a missile in a sector up to 110 degrees.

The radar antenna system, which is stowed on the roof of the hut during transportation, is set at an angle of 67.5 degrees relative to the horizon in an operational condition. It consists of phased antenna arrays for different purposes (primary, receiving, five supplementary receiving arrays, IFF system) and a comparator. The latter, which is structurally combined with the high-frequency gear of the receiver and transmitter, is installed on the roof of the radar hut. The radiating horn and the comparator receiving-horns unit are located at the focal point of the primary phased array radar.

The primary transceiver phased array 2.44 m in diameter is used for acquiring, tracking and illuminating targets, tracking missiles and transmitting commands. It consists of an array with a spatial, through method of powering consisting of 5,161 emitting elements with ferrite phase shifter. Array elements (in the transmit mode) are powered by the comparator's radiating horn, and the beam shaping and electronic control of its attitude in space is done by controlling the phase distribution of emitted signals by means of phase shifters. The phase of the SHF signal emitted by each array element can take the following six values: 180, 90, 45 and 22.5 degrees. The change of values is done by the phase shifters in a time not exceeding 12 microseconds. In the receive mode electromagnetic energy is received by primary array elements and is sent via controllable phase shifters to the comparator receiving-horns unit, where the cumulative signal and two difference signals necessary for measuring angular coordinates by the monopulse method are discriminated.

When the air defense missile is on the terminal leg of its flight trajectory the 54 cm diameter, 251-element receiving array receives data from the missile which are used to produce guidance commands, and in the remaining time it functions as an additional receiving phased array.

Five hexagonal supplementary receiving phased arrays of 51 elements each are used in the system for suppressing side lobes of the primary phased array radiation pattern to reduce the effect of active jamming on it.

The rectangular IFF system array, located beneath the primary phased array antenna, is connected by shielded cable with the AN/TPX-46(V)7 interrogator transceiver equipment.

Depending on the radar operating mode, the radar transmitter shapes SHF signals which vary in kind of modulation, pulse duration, pulse repetition frequency, power and operating frequency, and they are sent over a waveguide to the comparator radiating horn. The transmitter uses 160 operating frequencies in the 4-6 GHz band. The foreign press notes that the choice of this band (lower frequencies are used in acquisition radars and higher frequencies in guidance radars) is dictated by the multifunction nature of the AN/MPQ-53 radar.

The radar receiver amplifies and compresses the pulse signals, adjusts sensitivity and gain depending on the signal power, performs range gating, and provides correlation processing of signals, jamming detection and antijam protection. The cumulative and difference signals from the comparator entering the receiver (at an intermediate frequency) as well as signals from the receiving phased array antenna and five supplementary receiving phased array antennas are converted to video signals after the above operations have been performed.

After converting into digital form the signals coming from the receiver output, the processor performs a number of operations to process them; the need for processing is connected with ensuring radar functioning in various modes and with its accomplishment of several tasks simultaneously.

The control unit, which is based on a specialized computer, synchronizes operation of all radar equipment in accordance with commands coming from the control station. Based on data received as a result of the processor's signal processing, it produces announcements which are transmitted to the control station. The unit includes a microprocessor for controlling the antenna radiation pattern position, IFF system equipment control device, and data input-output device.

The interface equipment receives and decodes commands from the control station which determine parameter values, modes and algorithms to be used for functioning of the radar and its elements, and it encodes reports and transmits them over shielded cable. The latter are received by similar interface equipment at the control station.

The **AN/MSQ-104 control station** (Fig. 2 [figure not reproduced]) processes data from the multifunction radar and produces missile guidance commands as well as commands and other data necessary for controlling

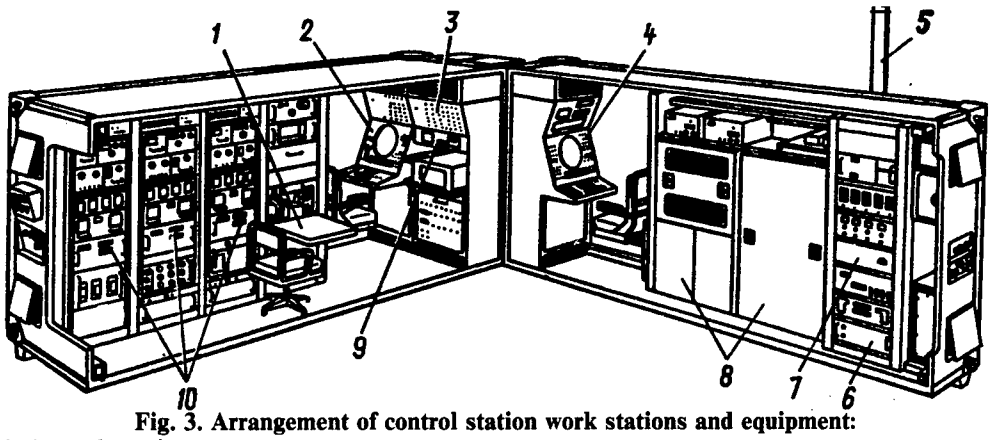


Fig. 3. Arrangement of control station work stations and equipment:

1. Commander's work station
2. First operator's work station
3. Air defense missile system equipment technical status monitor panel
4. Second operator's work station
5. Data transmission line antenna
6. Interface equipment
7. Data transmission line terminal
8. Computer
9. Power supply plant control station
10. Radio-relay station terminals

the radar and launchers during firing. The control station is housed in a standard hut which protects its equipment against the effect of an electromagnetic pulse. The hut is (6.8 m long, 2.6 m wide, 2.1 m high, weighs 5.4 tons) and is mounted on the chassis of an M814 truck. Their overall weight is around 17 tons.

The following are principal control station subsystems: computer, display and control equipment, terminals of radio-relay stations and data transmission line, interface equipment, and power distribution unit (Fig. 3).

The parallel computer, which performs operations on numbers both with fixed and floating points, consists of two processors (each with a speed of one million operations per second), input-output control unit, reader, and three storage devices.

The main storage, using circuits with medium-scale integration, has a memory capacity of around 212,000 24-bit words. American specialists believe that memory capacity can be increased to 262,000 words by including additional units in it.

A back-up (magnetic tape) storage contains all the programs and basic data necessary for air defense missile system fire control. They permit recovery of data stored in on-line memory in case data are lost or are distorted from the effect of an electromagnetic pulse, or when faulty units are replaced with new ones.

External storage with a capacity of 410 million bits is used to store programs which perform a check of the functioning of air defense missile system equipment and troubleshooting.

The display and control equipment is housed in two operator work stations outfitted within the hut. Each work station has a console with air situation display, an air defense missile system equipment technical status monitor panel, a computer data input panel, and various controls.

The control station combat team consisting of the commander and two operators controls all air defense missile system equipment and in so doing accomplishes the following tasks: estimates the air situation; determines the target engagement sequence; transmits commands to the radar which govern data processing, air defense missile guidance and use of antijam protection equipment; designates the launcher and air defense missile for engaging a target and controls their prelaunch preparation; determines the mode of fire and evaluates its results. Foreign press materials note that there are provisions for firing against targets using both one as well as several (usually two) missiles. In the latter instance a distinction is drawn between volley fire, where there is minimal time between the launches of two surface-to-air guided missiles, and sequential target engagement.

In an air situation estimate the data displayed on indicators of the left and right control consoles differ. For example, data on aircraft identified as targets are output to the left display with an indication of their preferred engagement priorities. The right indicator fully displays the air situation in the radar's sector of operation (different symbols are used to denote targets and friendly and unidentified aircraft) as well as locations of screened installations and other information characterizing the combat situation. The team commander makes the decision for combat while observing both displays.

American specialists believe that the high degree of automation in operation of the Patriot air defense missile system is determined by the presence of a high-capacity computer as part of the control station and the flexibility of its software. The latter includes three groups of programs designed respectively for placing the air defense missile system in a condition of combat readiness, supporting its operation, and monitoring to identify faults.

The **AN/MJQ-20 power supply plant,** designed to supply electrical power to the control station and radar, consists of two ac generators mounted on an M814 vehicle (each 150 kw, 400 Hz), and run by gas-turbine engines. A fuel tank is accommodated on a trailer. The power supply plant usually is set up in the immediate vicinity of the multifunction radar and control station (Fig. 4 [figure not reproduced]).

The **MIM-104 surface-to-air guided missile** (Fig. 5 [figure not reproduced]) developed by Martin Marietta is a single-stage solid-propellant missile of normal aerodynamic configuration. It is 5.2 m long, has a body diameter of 0.41 m, has a span of aerodynamic surfaces of 0.92 m and a weight of around 1,000 kg.

The missile consists of five sections. The nose section has a ceramic radioparent fairing with a wall thickness of 16.5 mm, which provides thermal protection of onboard gear at the high temperatures resulting from aerodynamic heating.

The second section contains the terminal leg digital guidance equipment unit and semiactive homing head with gyrostabilized antenna and monopulse receiver operating in a data relay mode.

The third section contains a fragmentation warhead (weighing around 80 kg), a safety servo mechanism and radio detonator as well as the digital equipment unit for missile guidance in the mid-leg of the flight trajectory, on-board digital processor, and gyroscopic sensor unit. The radio detonator antennas and antennas of the radio line for homing head data transmission to the AN/MPQ-53 radar are mounted on this section's housing.

Then comes the fourth section for the engine unit. The TX-486 solid-propellant single-stage motor developed by Thiolkol, the housing of which is a load-bearing component of the missile structure, is covered on the outside by a heat-insulating material. Two cable conduits run along the outer surface of the section. The motor's charge is made of fuel on a polybutadiene base with hydroxile end groups. According to assessments given in the foreign press, thrust is essentially constant during the motor's operation (fuel combustion period is 12 seconds) and equals 130 kN. At the end of the powered phase the missile has a maximum speed of Mach 6.

The fifth section of the surface-to-air guided missile is formed by a tail unit with aerodynamic control surfaces and a hydraulic drive unit accommodated in the space between the missile housing and outer surface of the motor nozzle. In the opinion of foreign specialists, the effectiveness of control surfaces in combination with good aerodynamic characteristics of the missile provide for its high maneuver capabilities. For example, it is reported that the lateral limit load factor reaches 40 and the load factor on the missile's terminal leg of the flight trajectory equals 25.

There is combined **missile guidance to the target.** Radio command guidance is used on the mid-course leg of the flight trajectory and so-called TVM (Track-via-Missile) guidance is used on the terminal leg.

During radio command guidance, which begins after the brief phase of placing the missile on a trajectory, data on the target and missile received when they are tracked by the beam of the primary radar phased array antenna are processed at the control station and transmitted to the missile in the form of commands (by the very same antenna). The foreign press reports that when this method of guidance is used it supports the missile's flight along the optimal powered trajectory.

The TVM method is a variety of semiactive radar guidance. It differs from the latter in that signals reflected from the target and received by the homing head are not processed aboard the missile but are transmitted to the system radar. They are used together with data on the target and missile being received from the primary radar phased array antenna for producing guidance commands at the control station which are transmitted to the missile.

Foreign specialists assume that a high precision and high antijam capability of the guidance system have been achieved along with the capability for conducting fire against the jammer thanks to data received from two sources (the homing head and the radar), use of complex algorithms for their processing, and high speed of the control station computer.

The missiles are received by the troops in sealed transport-launch canisters made of aluminum alloy. The canister with missile weighs around 1,700 kg. The missile is on guide rails in the transport-launch canister, the inner surface of which is coated with a fire-resistant material, and an arresting device keeps the missile from longitudinal movement before launch. The outer surface of the canister has pick-up points used during loading and unloading operations and when loading the launcher.

The **M-901 launcher** (Fig. 6 [figure not reproduced]), which holds four transport-launch canisters with missiles, is mounted on an M860 semitrailer transported by the M818 wheeled prime mover. Launcher equipment includes a support frame with elevating and traversing

mechanisms, electronic unit, data transmission radio line antenna, and self-contained ac generator with diesel engine. The fuel tank capacity ensures operation for several hours.

When a launcher is deployed at the launch position its support frame with transport-launch canister is rotated in azimuth to the designated direction of fire (the base's maximum traversing angle is plus or minus 90 degrees), set at a 38 degree angle of elevation and fixed using the arresting devices. The launcher is controlled from the control station. Signals received by the antenna are decoded by the electronic unit equipment and go to the missile in the form of commands. The unit also produces and encodes announcements about the execution of commands and technical status of the launchers and missiles; the announcements are transmitted to the control station over the radio line.

The **system communications equipment** includes AN/MCR-137 radio-relay stations and antenna mast groups. The latter are telescopic masts (a maximum height of 30.5 m) mounted on the M814 truck, and antennas with a variable direction of emission and reception are mounted on them. Use of this equipment provides communications among control stations of firing units and with other control organs in the absence of line-of-sight.

The system's **auxiliary operating equipment** includes the following:

—Transporter-loader vehicle (M819 truck-tractor with hoisting crane and M269A1 semitrailer with four transport-launch canisters);

—Mobile maintenance point (on M814 truck chassis) with generator accommodated on a trailer;

—Vehicle for transporting small spare parts;

—M819 truck-tractor with hoisting crane and M269A1 semitrailer for transporting large spare parts.

Tactical employment and control. The Patriot air defense missile system unit of fire is the firing battery which has a control station, multifunction radar, power supply plant, eight launchers, and a set of auxiliary operating equipment. Launchers are deployed at a launch position at a distance up to 1 km from the control station.

The Patriot air defense missile battalion consists of six batteries as well as control and service subunits. A battalion has electronic warfare teams intended for deploying decoy transmitters near the radar; American military specialists believe that the latter provide effective protection for the radars against antiradar missiles.

The AN/MRC-136 battalion command post permits controlling six batteries as well as interworking with adjacent battalions. Commands can arrive at the command post both from ground air defense control entities as well as from AWACS aircraft.

The battalion command post is basically similar in design execution and equipment make-up to the AN/MSQ-104 control station, but differs from it by the presence of one processor (not two) as well as by software which takes into account the features of missions it is to accomplish.

The Patriot battalion provides both for centralized and decentralized control of combat actions. In the first instance the selection of targets to be destroyed and their allocation among batteries is made and engagement sequence determined at the command post based on air situation data. Taken into account in the decisionmaking is degree of airborne target threat, coordinates and orientation of the batteries' sectors of fire, as well as the coordinates, size and importance of screened installations.

In the second instance control is exercised from the control station with preservation of its communications with the data transmission radio line command post. The variants are fully autonomous control and so-called independent control in which commands from higher entities are transmitted over radiotelephone communications channels.

U.S. ground forces in Europe began to be **outfitted with the Patriot complex** in 1984. In accordance with an agreement between the American and West German governments, 28 Patriot air defense missile system batteries will be delivered to the Bundeswehr (two are to be used as reserve batteries and two for personnel training), with the purchase of 14 financed by the FRG government. As payment for delivery of the other 14 systems, the FRG undertakes to man 12 of the 54 American Patriot batteries located in the southern part of the country and to finance expenses for their pay and allowances for ten years. In addition, the West German government will pay for the purchase of 27 Roland-2 surface-to-air guided missiles for air defense of three American air bases in the FRG and their operation (including personnel pay and allowances), also for ten years. As the foreign press noted, the possibility of acquiring the Patriot air defense missile system also is being considered by other NATO countries: France, Italy, the Netherlands, Belgium and Denmark. Japan is planning to produce 26 Patriot systems under American licensing for subsequent replacement of the obsolete Nike Hercules and Hawk air defense missile systems.

The **Patriot air defense missile system is being modernized** in the United States under the ATM (Anti-Tactical Missile) program to improve system capabilities of engaging operational-tactical ballistic missiles. Judging from foreign press materials, as a result of this program's

implementation it is planned to develop a new directional warhead for the missile and improve control station computer software. It is expected that the latter will permit using a special ballistic missile acquisition and tracking mode in the Patriot system radar and increasing the target search sector in this mode by up to 70 degrees in elevation. It is also planned to develop an algorithm for guiding a missile flying on a ballistic trajectory to the target.

The Patriot air defense missile system was fired against a ballistic missile for the first time in tests in September 1986. It was reported that the target (a Lance missile) was successfully destroyed at an altitude of around 8 km and at a range of 13 km. The missile's flight speed at the impact point was Mach 3 and the Lance missile was flying at Mach 2. It is planned to continue tests in the current year.

6904

West German Antitank Mine System

18010022d Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 8, Aug 87 (signed to press 6 Aug 87) pp 29-30

[Article by Col (Res) N. Zhukov]

[Text] In mid-1986 Bundeswehr units began to be equipped with a new means for fast laying of antitank minefields, the MiWS (Minen Wurf System) remote mining system. It includes the Skorpion self-propelled minelayer and DM1274 antitank belly attack mines. System tests ended in 1983 and an official decision was made a year later adopting it for the Bundeswehr and beginning production. It is planned to deliver a total of 300 units to the troops.

The Skorpion minelayer (Fig. 1 [figure not reproduced]) is based on the American M548 modernized tracked transporter, designated the M548GA1 in the Bundeswehr. A launcher which includes six mine cassettes (each with five mine magazines) is installed on the vehicle's cargo bed.

The mine magazine is expendable. It is a prismatic sheet metal unit which contains four short launching tubes (each with five DM1274 mines and a pyrotechnic cartridge for firing). When placed in the cassettes the mine magazines are connected by special plugs with the EPAG fire control electric firing system. One cassette has a total of 100 mines (accordingly there are 600 in the minelayer).

The DM1274 antitank mine is a variant of the AT-2 mine specially designed for this system (another variant is the DM1233, designed for laying by the LARS-2 and MLRS multiple-launch rocket systems and fitted with a brake parachute). The DM1274 mine has a directional charge with a contact element operating according to the principle of a hollow-charge impact shot and capable of penetrating the bottom of a modern tank or demolishing its track. The mine is fitted with an electronic fuze with a contact sensor in the form of a thin, rigid pin. The fuze includes an antilift device causing the weapon to detonate when an attempt is made to remove it from its place, and a self-destruction unit. By means of the latter device a mine can be laid in an armed condition for a strictly determined time (from 6 to 96 hours), at the end of which it automatically detonates. The power source for the fuze's electronic circuits is a battery which retains working capacity for ten years of depot storage. The mine's overall weight is 2.22 kg, case diameter is 103.5 mm, and its height is 129 mm.

The MiWS remote mining system also includes the EPAG fire control device (Fig. 2 [figure not reproduced]), used to check the working capacity of all electrical systems of the minelayer and each mine, to program the operating mode of fuzes, and to set and maintain the requisite mode and sequence for firing mines from the magazines.

The process of loading the minelayer consists of placing mine magazines in cassettes and connecting appropriate electric firing circuits. Magazines with mines usually are kept at ammunition depots in standard packaging.

When a minefield is laid a loaded minelayer moves in a given direction at the requisite speed, successively igniting pyrotechnic cartridges in the launchers. Fired mines fall behind the vehicle in a zone 50 m wide. Then they are stabilized and after an arming delay mechanism triggers they are shifted to an armed condition.

The foreign military press has reported that the new mining equipment will be used for laying obstacles of great length in advance or directly during combat. It is believed that the capability of the DM1247 [sic] mines to function against the entire width of the projection of armored targets will permit reducing the density of obstacles laid from 1 to 0.4. Because of this one minelayer load is sufficient for laying a minefield of greater length. It is also reported that a 1,500x50 m mine strip can be laid by one vehicle in 5-10 minutes.

6904

NATO 'Tactical Fighter Meet' Tactical Air Exercise

18010022e Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 8, Aug 87 (signed to press 6 Aug 87) pp 31-36

[Article by Col V. Grachev, candidate of military sciences]

[Text] In the course of combat training by tactical aviation of NATO countries, along with day-to-day training and various national exercises great emphasis is

placed on its involvement in maneuvers and exercises within the framework of the bloc OVS [Joint Armed Forces] both in coordination with ground forces and independently. The annual "Tactical Fighter Meet" opposed-forces tactical air exercise is an example.

Such an exercise was held on the territory of Great Britain in 1986, with air units and subunits of eight states taking part. In particular, the U.S. Air Force was represented by crews of the 401st Tactical Fighter Wing [TFW] (F-16 aircraft), 747th Squadron (F-16's), 393d and 715th Bomber Squadrons (FB-111's), and 52d TFW (F-4E's and F-4G's). Also involved in the exercise were the 439th Squadron (CF-18's) from the Canadian Air Force, 1st and 8th squadrons (Mirage-5B's) from the Belgian Air Force, 725th Squadron (F-35 Drakens) from the Danish Air Force, 313th Squadron (NF-5A's) from the Dutch Air Force, the 4th and 5th squadrons (Jaguar-A's) from the French Air Force, and 32d and 38th squadrons (Tornadoes) from the FRG Air Force. The British Air Force assigned the 54th Fighter-Bomber Squadron (Jaguar-GR.1's) and several air defense squadrons (outfitted with Tornado-F.2, Lightning, Phantom-FGR.2 and Hawk aircraft and the Rapier surface-to-air guided missile) as well as several support units and subunits. In addition, EF-111 electronic warfare [EW] aircraft (U.S. Air Force) and E-3A AWACS aircraft (NATO AWACS Command) were used.

The principal objectives of the exercise were to check the advisability of using groups of different types of aircraft within the scope of a unified tactical plan; to adjust schemes for forming mixed tactical formations; to improve organization of control, coordination and tactical support; to develop new variants for penetrating air defense, techniques for conducting EW and methods of delivering strikes; and to evaluate the methodology for planning and preparing tactical actions.

As the foreign press reports, in organizing the exercise the NATO command tried to bring the conditions under which it was held as close to actual combat conditions as possible. A number of serious difficulties had to be overcome. The greatest obstacles arose in selecting sectors outside of ranges for the aircraft to fly to the target at low altitude. Local air traffic routes and numerous prohibited areas were a hindrance. Mock-ups of "enemy" ground force equipment (two columns), mock-ups of air defense missile system positions and an airfield were formed up as strike targets on the Otterburn range. It was authorized to employ organic weapons against all these targets. Operating air defense missile system and jammer simulators as well as an objective monitoring system were set up 4 km away (at the Sneidedham range). This permitted bringing the air defense zone right up close to the screened targets and evaluating the sides' actions with a sufficient degree of accuracy. In the opinion of NATO specialists, however, the limited number of corridors established for strike aircraft flights to targets deprived commanders of freedom in choosing "incursion" tactics.

The "enemies" developed their plans independently in planning tactical actions after familiarization with the exercise concept, content of missions and make-up of the sides. The exercise control group approved the plans after they were adjusted with the objective of ensuring safety. The time and nature of raids were not made known to the defending side.

First phase plan. The basis of this plan for the strike grouping was a raid on two columns of "enemy" ground troops. The plan envisaged dividing the forces into three waves. The first wave (short range) included CF-18, Mirage-5B and NF-5 aircraft. The primary mission was to clear the air space and neutralize the zone's air defense system. The second wave (medium range) included F-16, Jaguar and Tornado aircraft. The primary mission was to neutralize the targets' air defense and deliver a strike against the first (near) column. The third wave (long range) consisted of F-16 (Fig. 1 [figure not reproduced]), Tornado and F-111 aircraft. The primary mission was to deliver a strike against the second column at the maximum radius of action. F-4G Wild Weasel and EF-111 EW aircraft were assigned to a separate group. Their mission was to destroy air defense system radars along the route with antiradar missiles (F-4G's) and provide active jamming from the zones and tactical formations of the strike group (EF-111's).

The E-3A AWACS aircraft were attached only to the defending side (to the air defense forces). Therefore the strike grouping had to organize tactical control relying on its own resources and capabilities. Group commanders (leaders) were given full independence in decision-making and in directing the crews of wing aircraft. Their actions were monitored only in the immediate zone by ground control points situated on "friendly" territory.

Each of the three waves was given its own direction for proceeding to the strike targets (northern, central and southern corridors). Groups of a varying tactical purpose—strike, cover (escort) and air defense neutralization—were included in their combat formation. The second wave (F-16 and CF-18 aircraft) was intended for preventing attacks by "enemy" fighters on the strike aircraft. Its pilots were given the right not to catch up with the strike group after lengthy air combat.

Group commanders planned the flight of their aircraft so as to avoid encountering "enemy" fighters and preferred to engage them only in case of extreme necessity. Crews of F-4G Wild Weasel aircraft were assigned the mission of knocking out air defense system radars. Following this the strike aircraft were to attack air defense missile system positions.

The British journal *Flight* noted that what was most difficult to do was to plan neutralization of the short-range Rapier air defense missile systems, which have an optical guidance system and do not radiate electromagnetic energy. It is difficult to detect the launch pads of this mobile system visually and practically impossible to

do so using radiotechnical equipment. Active and passive jamming have no effect on optical guidance systems. Therefore the strike group commanders chose the tactic of penetrating air defense at low and extremely low altitude with nap-of-earth flying and concealment against the background of the earth's surface. With consideration of safety restrictions, the minimum altitude on the route was set at 230 m (a speed of up to 890 km/hr), and in the vicinity of the target at 140 m (a speed of up to 1,000 km/hr).

Each group also could perform certain other missions in addition to the primary mission depending on the situation. In particular, Sidewinder missiles for air combat and pods with active jammers and with thermal and radar decoys (dummy targets) were suspended on the Jaguar strike aircraft for this purpose in addition to air-to-ground weapons.

Course and results of first phase. As the western press indicates, the echeloned raid outlined in the plan was executed without substantial deviations: mixed groups made the approach to their targets from three directions at given time intervals, but only the crews of the Jaguar-GR.1 and Tornado aircraft (UK and FRG air forces) were able to employ weapons. The Jaguar-A and F-111 aircraft groups (French and U.S. air forces) did not carry out the mission. Three primary reasons which hindered this were determined in a critique of the exercise.

The first reason consisted of adverse weather conditions. Far from all crews were ready to execute attacks beneath a lower edge of clouds which was at an altitude of 150-200 m. Of all the bombing methods, essentially only one remained possible—from level flight. This required special bombs and clusters with brake gear, since it was impossible to employ other weapons due to possible damage to friendly aircraft.

The second reason consisted of aircraft "losses" in air combat against "enemy" interceptors, which had greater freedom in choice of tactics and had the advantage in attacks from medium ranges. Concerning the latter, the British journal *Flight* wrote that Tornado-F.2 air defense fighters armed with Skyflash missiles (Fig. 2 [figure not reproduced]) were committed under favorable conditions, obtaining air situation data and target designation data from the E-3A AWACS aircraft.

The third reason was the high effectiveness of jamming used by air defense forces. EW equipment was turned on for a short period (30 seconds), but at the most important moment—after the strike aircraft were on the bombing run. The aiming process was disrupted under these conditions. Real jamming in the strike forces' communication lines (which pilots have a hard time enduring) was replaced by music, but even in this case an exchange of information between aircraft crews and groups was impossible. In the interests of flight safety the duration of one-time musical jamming was reduced to 10 seconds and radiated power was reduced considerably.

The foreign press noted that greatest success was achieved by crews of the UK Air Force 54th Squadron's Jaguar aircraft, who were the first to deliver a strike against the near column. An experienced crew assigned for marking the target played an important role in executing the mission. Despite limited visibility, this crew made a precise in-flight and dropped clusters of signal bombs on it. Orienting themselves on the easy-to-spot colored smoke, the other crews of the group attacked the "enemy" column precisely from the move.

In assessing results of the first phase, the exercise heads noted that pilots of European country air forces, who have extensive experience of flying in bad weather and especially under limited visibility, functioned the best under the difficult weather conditions; they also achieved best results in delivering strikes, not having lost skills in visual route monitoring, target search and aiming, while U.S. Air Force crews were unable to achieve high indicators under "European conditions."

The **second phase plan** envisaged an exchange of the sides' functions. U.S. Air Force subunits which had been part of the air defense forces in the first phase of the exercise now became the primary strike grouping. UK Air Force squadrons equipped with F-4, Lightning and Tornado-F.2 aircraft as well as the Hawk attack aircraft armed with Sidewinder air-to-air guided missiles and an underfuselage gun mount acted as the defending side. The E-3A AWACS aircraft remained in the air defense grouping.

U.S. Air Force representatives, who were given the right to independently plan offensive actions in this phase, supplemented the strike forces with a group of F-111 aircraft, and yesterday's "enemies"—the Mirage, F-15 (Fig. 3 [figure not reproduced]), F-16 and CF-18 aircraft—became part of the "escort" (cover groups). An airfield and its air defense was designated as the primary target of actions.

Two strike groups were assigned to deliver the attack on the airfield and for fire suppression of the Rapier air defense missile system and AAA covering it. A third group consisting of Jaguar-GR.1 aircraft of the UK Air Force (Fig. 4 [figure not reproduced]) was given the mission of destroying the launch position of a Bloodhound-2 medium-range air defense missile system.

The exercise concept provided for the aircraft to be over the target for a minimal time. The interval between attacking crews was set at 5 seconds. Flight at low and extremely low altitude providing a concealed approach to the strike target remained the primary method of penetrating the air defense. It was planned to make target approaches from different directions to confuse air defense weapon teams and dissipate air defense fire. Maximum consideration was given to "blind" zones formed because of terrain relief for scanning radars of the "enemy" air defense system.

The **course and results of the second phase** were examined in the western press based on the example of a flight of British Jaguar-GR.1 fighter-bombers flying in a diamond formation. In addition to them, Tornado aircraft of the FRG Air Force, a flight of U.S. Air Force F-16 fighters and a flight of Dutch Air Force NF-5 aircraft (four aircraft each) were included in the tactical formation. Taking into account the experience of the first phase, where the attacking side suffered heavy losses as a result of attacks by "enemy" interceptors, the cover group was moved forward and was given freedom to maneuver.

The distance between strike groups of Tornado and Jaguar aircraft was 7.4 km. The NF-5 flight flew behind at the limit of visual visibility and the F-16 flight flew 3.2 km in front of the Jaguar aircraft. Strike groups maintained a minimum altitude of 75 m for safety conditions and their speed did not exceed 800 km/hr. The flights were made under radio silence.

As the foreign press reported, an analysis performed during flight preparations showed that "enemy" Lightning fighters were the first which should attack the strike group. Therefore during the flight a Jaguar pilot decided that he was being attacked by Lightning aircraft after receiving a signal from the warning system that the aircraft was being painted by an "enemy" fighter's airborne radar. A report came in right then from an adjacent flight about visual detection of a pair of Lightning aircraft. At the leader's command the group executed a defensive maneuver but an attack did not come. It was learned in the critique that earlier the flight of Lightnings had successfully attacked the F-16 cover fighters moved out in front and it did not see the strike group aircraft.

Tornado-F.2 fighter-interceptors were operating in the defenders' second wave, but there was no encounter with them. Continuing to fly at an altitude of 75 m, the strike groups reached the break-off line and reformed into tactical formation for a more convenient target approach. They entered a valley which had hills up to 180 m high on both sides, but flashes soon appeared on both sides created by Rapier air defense missile launch simulators and then traces of the flight of AAA projectiles and streams of smoke left by medium-range surface-to-air missiles also became visible. Weapons (bombs with brake gear) were dropped from low altitude from the move.

Without altering the flight mode, the aircraft took a route to arrive at the Sneidedham range to attack the radars. One minute before they approached the target the enemy put out intensive communications and radar jamming. Warning signals that the aircraft were being painted by radars of air defense missile systems appeared somewhat earlier. The group reformed, executed an antiradar maneuver and began dropping chaff and IR decoys. The wing pair switched on active jammers.

The group was attacked in the vicinity of the targets by Hawk aircraft (Fig. 5 [figure not reproduced]) armed with Sidewinder guided missiles and underfuselage gun mounts. Crews of the Jaguar fighter-bombers had to repel the attack by the light, maneuverable attack aircraft. The air combat did not end in their favor. A characteristic feature of it was the comprehensive use by air defense forces of various types of aircraft performing functions not inherent to them. Hawk attack aircraft received necessary information from the Tornado-F.2 fighter-interceptors equipped with powerful airborne radars and were vectored to targets by them. Having broken formation as a result of the attack by Hawk attack aircraft, Jaguar aircraft then came under a missile attack delivered by Tornado-F.2 fighters outside limits of visual visibility. The variant employed for the first time in the UK Air Force of close interworking in air combat by an attack aircraft equipped with short-range weapons and an interceptor with medium-range all-aspect missiles was recognized as promising. As the journal *Flight* notes, the two-echelon alinement of different types of aircraft with various tactical capabilities under control of an E-3A aircraft represented a formidable force.

Based on experience of this exercise, western specialists particularly single out the problems which forced making adjustments to the process of further training of NATO countries' tactical air crews. They include actions under adverse weather conditions and methods of conducting electronic warfare and penetrating troop air defense.

It is noted in particular that adverse weather conditions (a totally overcast sky with a lower edge at 150 m and poor visual visibility) significantly limited air actions. The aircraft were unable to form in large groups and compact combat formations, and the time for delivering the strike stretched out. Guided weapons with laser and television guidance could not be used in the clouds. There was a "lack" of space to execute the calculated maneuver without entering the clouds. Aircraft forced to operate in a range of low altitudes were fitted only with special bombs which had a low accuracy of hitting the target. Based on their training level many pilots were unable to cope with the advanced flight elements, and especially tactical employment.

Despite previously instituted limitations on the use of jammers, the effect of electronic countermeasures was rather strong. Passive and active jamming of airborne equipment, including radio communications equipment, hampered the process of aiming (laying weapons), disrupted coordination and control, and deprived aircraft crews of situation data. In many cases this led to nonperformance of the combat mission. The use of antijam equipment and methods was ineffective.

Results of air defense penetration by the strike groups were discomforting. For example, after the second phase of the exercise had been conducted Rapier air defense missile system combat teams announced the "downing"

of 60 airborne targets (i.e., almost all aircraft which flew through their impact zone). The mistake by the attacking side, which attempted to penetrate to the targets along a hill-ringed valley, was noted in the critique. Mobile air defense systems were situated on the hills; they had a good all-around field of view and sufficient time reserve for preparing the aimed launch of missiles. This affected results. But the primary reason was the forced descent of strike groups to low altitude because of the low ceiling and denial of an opportunity to execute broad enveloping maneuvers. Methods used by the strike groups to combat air defense forces and attempts to neutralize the air defense by jamming or destroy it by fire had no appreciable success.

6904

Israeli Lavi Tactical Fighter

18010022f Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 8, Aug 87 (signed to press 6 Aug 87) pp 36-39

[Article by Lt Col V. Kuzmin]

[Text] In taking an expansionist, predatory course, Israel's Zionist leadership is trying to ensure military and technical superiority over Near East Arab countries. Using U.S. political and economic support to this end, Tel Aviv is giving extremely great attention to developing and strengthening its armed forces, outfitting them with the most up-to-date weapons and combat equipment, and building up the country's military-economic potential. Israel views its Air Force, which has a continuously modernized aircraft inventory, as one of the most important tools for implementing adventuristic plans.

The program for creating the Lavi fighter began in 1980. Judging from foreign press materials, it is being developed as a multipurpose tactical fighter for standard missions of close air support for ground troops, interdiction of the combat zone, combat against airborne targets, and air defense. Israel Aircraft Industries is the prime contractor, but implementation of this program, the most ambitious ever carried out in Israel, would have been impossible without decisive U.S. financial and engineering help. For example, as of the present time the Americans already have provided monetary subsidies amounting to $1.8 billion for developing the Lavi. Israel concluded more than 150 contracts worth a total of $800 million with 80 American firms, including firms such as Grumman, Lear Siegler and Pratt and Whitney for development and initial production of individual aircraft assemblies, machine units and systems. In addition, new U.S. technology is being freely given to Israel under an agreement signed in 1983 which considerably facilitates an increase in capabilities of its aircraft-construction, electronics and other sectors of industry.

The foreign press notes that the Lavi aircraft was specially designed to penetrate a dense enemy air defense in performing the combat mission and has powerful missile-bomb armament. The Israeli Air Force command plans to use it to replace Kfir tactical fighters and A-4 Skyhawk attack aircraft now in the inventory before the year 2000, as well as the TA-4 and F-4E Phantom aircraft being used as operational trainers for advanced flight training. It is planned to build a total of 300 Lavi fighters, including 60 in a two-seat version. The Lavi's first test flight was in December 1986 and the second prototype began flights in April 1987.

The Lavi tactical fighter is a low delta-wing monoplane (54 degree sweep on the leading edge) with truncated tips, aerodynamic control surfaces in front, single-fin tail unit and retractable tricycle landing gear. The engine air intake is beneath the fuselage. The aircraft's design performance characteristics are given below. Up to 25 percent of the fighter structure including the wing, leading control surfaces, fin, nose fairing, undercarriage doors and underfuselage fins are made of composite materials. The wing is fitted with two pairs of elevons (outboard and inboard) and leading-edge flaps. Aerodynamic brake flaps are installed in the rear fuselage. The wing and fin have been developed and presently the American firm of Grumman is making the initial production of 20 sets, after which they will be produced in Israel.

Weight, kg:	
Maximum take-off	19,200
Maximum load on external suspension	7,250
Fuel in internal tanks	2,700
Fuel on external suspension	4,150
Maximum flight speed at 11,000 m without external suspensions, Mach	1.8
Air defense penetration speed, km/hr:	
With 2 air-to-air guided missiles and 8 750 pound Mk 117bombs	Around 1,000
With 2 air-to-air guided missiles and 2 2,000 pound bombs	1,100
Angular velocity of sustained turn, degrees/sec	13.2
Maximum angular velocity of turn, degrees/sec	24.3

Maximum banking velocity, degrees/sec	300
Combat radius, km:	
With 2 air-to-air guided missiles and 8 750 pound bombs with low altitude flight	Around 500
With 2 air-to-air guided missiles, 2 Mk 84 2,000 pound bombs or 6 Mk 82 500 pound bombs in variable profile flight	2,100
Geometric dimensions:	
Aircraft length, m	14.6
Height, m	4.8
Wing span, m	8.8
Wing area, m^2	33
Wheelbase, m	3.9
Wheel track, m	2.3
Range of design operating g-loads	From -3 to +9

The power plant consists of one PW1120 turbojet bypass engine (TRDD) by the American firm of Pratt & Whitney with 9,360 kg(f) thrust in afterburner. This turbojet bypass engine was developed on the basis of the F100 engine created for the F-15 and F-16 aircraft and has up to 70 percent assemblies and machine units common with it, but because of design improvements the PW1120 has improved performance when operating at high flight altitudes and speeds, as well as lesser (by 12 percent) specific fuel consumption in the afterburner mode. Its flight tests began in the F-4 aircraft in the summer of 1986. Under the contract the Americans will deliver some 40 engines for all aircraft prototypes and the first lot of series-produced engines; the engines are to be produced under license by the Israeli firm of Bet Shemesh Engines. In particular, the first ten engines will be delivered fully assembled, the following ten partially assembled, and the remaining engines in the form of individual sectional components and assemblies. Meanwhile it is reported that Bet Shemesh Engines presently is in difficult financial straits and possibly will not be able to fulfill the order to produce those engines. In this case it is planned to deliver them from the United States. Performance characteristics of the PW1120 turbojet bypass engine are given below.

Maximum thrust, kg(f):	
With afterburning	9,360
Without afterburning	6,150
Specific fuel consumption, $kg/kg \cdot hr$:	
With afterburning	1.86
Without afterburning	0.8
Air consumption, kg/sec	81
Bypass ratio	0.2
Cumulative pressure ratio	27
Turbine inlet temperature, degrees C	1,400
Weight, kg	1,290
Length, m	4.1
Maximum diameter, m	1.02

The Mk 10 ejection seat made by the British firm of Martin-Baker is installed in the Lavi allowing the pilot to abandon the aircraft safely on the ground and in the air at calibrated speeds up to 1,100 km/hr. The principal on-board equipment includes the EL/M-2035 multimode pulse-Doppler radar, ACE-4 central computer, inertial navigation system, SPS-200 warning receiver, electronic warfare equipment, radio communications equipment, fly by wire quadruple-redundant control system (mechanical back-up not provided). The aircraft makes wide use of microprocessor engineering (20 large and 60 small microprocessors for various purposes). It is noted that all on-board equipment is modular and has high antijam capability.

The EL/M-2035 radar in the 3-cm wave band was developed by the Israeli firm of Elta based on the EL/M-2021 radar, which was flight tested in the F-4 but was not placed in series production. The EL/M-2035 has higher resolution and the range for detecting airborne targets is around 55 km. It operates in two switchable modes for acquiring airborne targets in the near zone and in a single mode for tracking airborne targets, and it supports flight at low altitudes and ground mapping.

The ACE-4 central computer was developed by the Israeli firm of Elbit with consideration of the American 175A programming standard. Its memory capacity is 128K words, its speed is 600,000 operations per second, it weighs around 5 kg, and its mean-time-between-failures is 2,500 hours.

A wide angle elctro-optical head-up display and three universal displays, one with color screen, are installed in the pilot cockpit. Only data directly relating to the combat mission being accomplished at the given moment will be shown in graphic and tabular form on the displays in flight. The pilot can easily read data in full daytime illumination.

Elta is developing an EW system for the Lavi fighter which is to provide all-around detection of the electromagnetic emissions of enemy radars in the 2-18 GHz

band and will allow taking necessary countermeasures in an automatic mode using passive and active jamming. It is planned to install both internal and external EW equipment on the aircraft.

Missile and bomb ordnance is accommodated on the fighter on four underwing attachment points, on two wingtip attachment points (only for Shafrir, Python-3 and Sidewinder air-to-air guided missiles) and six underfuselage attachment points. The latter are disposed in three tandem pairs and the bombs on them are semirecessed in the fuselage, which substantially reduces their drag. In addition, a DEFA single-barrel 30-mm cannon is installed in the aircraft.

According to foreign press reports, it is planned to manufacture six aircraft prototypes for flight tests (including four in the two-seat version) and one prototype for ground tests. The first two test aircraft (see photo [photo not reproduced]), which are flying twice a week, are being used basically for studying the aircraft's aerodynamics in the full range of flight altitudes and speeds, for flutter tests, and for determining take-off and landing characteristics. In addition, the second model of the Lavi is fitted with an aerial refueling system. Flight tests of the third model are planned to begin in late 1987 and the rest during 1988-1989. An incomplete set of electronics will be installed in the third and fourth aircraft, and only the fifth and sixth are planned to be outfitted with a full set (the first and second models chiefly use equipment from the Kfir fighter). The firm figures on completing essentially all work involving flight tests in three years.

It is planned to begin series production of the Lavi in 1990. In the assessment of Israeli specialists, the production rate initially will be 12 per year and 30-36 per year by the mid-1990's. As the foreign press notes, however, sharp debates have unfolded over the Lavi program over the last two years. Although test aircraft already are flying, nevertheless resistance is growing in the United States and in Israel itself to implementing this project allegedly in view of its excessive cost. For example, while in 1981 it was determined that the cost of this aircraft would only slightly exceed the cost of the American F-16 fighter, by the present time it already exceeds that cost by almost 50 percent. The cost of the entire program for developing and producing 300 aircraft may reach $15 billion.

U.S. militaristic circles believe that implementation of this program will force Israel to sacrifice the development of other kinds of military equipment and arms, and they are insisting on its cessation. Such a wish is caused not only by the project's excessively high price, however, but also by fears of the military-industrial complex that the Lavi may represent a serious competition to American aircraft in the international market. The following are proposed as alternative versions of a cessation of work on the Lavi program: joint production of the AV-8B V/STOL fighter; purchase in the United States or production in Israel of basic assemblies for 250 AV-8B aircraft and purchase of 50 F-15E fighter-bombers; producing the F-16C Fighting Falcon fighter under license in Israel; producing the F-16C in Israel and equipping them with the Lavi's electronics; acquisition in the United States or joint production in Israel of 300 F-18 Hornet tactical fighters. Time will tell what final decision will be made by the Israeli government. Nevertheless, regardless of the outcome, Israel in any case will receive modern tactical fighters for its Air Force inventory which will be used in aggressive actions against Arab states.

6904

NATO Airborne Inertial Navigation Systems

18010022g Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 8, Aug 87 (signed to press 6 Aug 87) pp 39-41

[Article by Lt Col R. Dasayev: "New Airborne Inertial Navigation Systems"]

[Text] In the near future it is planned to refit aircraft of the imperialist NATO bloc member countries with new navigation systems and equipment because, as western military specialists believe, equipment for this purpose presently in the inventory is obsolete and does not satisfy modern demands for accuracy, operational range, noise immunity and reliability. The leading role in implementing these plans is set aside for the NAVSTAR global satellite radionavigation system. Autonomous navigation equipment, which in the future is to operate together with NAVSTAR users' on-board equipment, also is being perfected in parallel with this system's development to improve reliability of navigation support under combat conditions. Judging from foreign press reports, the principal direction for perfecting autonomous navigation equipment lies in creating precision inertial navigation systems (INS) based on ring laser gyroscopes and laser gyroscopes with a fiber-optic light guide.

The action of the **ring laser gyroscope** is based on the phenomenon of interference arising with the summation of incoming light beams. The basic element of such a gyroscope is a ring vibrator consisting of three or more mirrors forming a closed loop (Fig. 1). The linear gas laser in a number of gyroscope designs is a sealed glass tube filled with a gas mixture such as isotopes of helium and neon. Luminous laser radiation appears in both directions and a standing wave is built up when voltage is applied to the anode and cathodes.

When the vibrator rotates about an axis perpendicular to its plane, the paths which two incident waves must cover to reach their point of emergence will vary. Frequencies of the incident beams change accordingly and pulsations arise between them at the mixer output with a difference

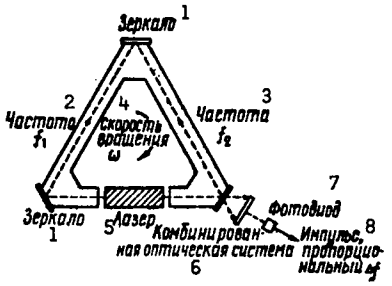


Fig. 1. Principle of operation of ring laser gyroscope:
Key:
1. Mirror
2. Frequency f_1
3. Frequency f_2
4. Speed of rotation omega
5. Laser
6. Combination optical system
7. Photodiode
8. Pulse proportionate to delta$f$

frequency which is a linear function of the angular velocity of the gyroscope base, i.e., it is an angular velocity sensor. The angle of rotation of the ring laser gyroscope base can be determined by counting the number of pulses at the mixer output. In a real gyroscope the output characteristic form is of a nonlinear character—there is a zone of insensitivity caused by the phenomenon of the capture of light beams propagating toward each other at low angular velocities.

Ring laser gyroscopes developed by American firms usually have a rectangular or triangular shape. They are manufactured with different perimeter dimensions and have different path lengths for laser beams. For example, Litton manufactures gyroscopes with a perimeter of the rectangle of 28, 17, 12 and 6 cm, and the beam path length in this firm's most precise gyroscope is 28 cm. It is reported that a gyroscope with such parameters is intended for bomber inertial navigation systems.

The principal merits of inertial navigation systems using laser gyroscopes are considered to be high reliability (because of the absence of rotating components), the insignificant dependence of the equipment's degree of accuracy on its cost, and the short time for being placed in a combat-ready condition. Among deficiencies of such inertial navigation systems foreign specialists include the presence of a zone of insensitivity at low angular velocities, the need for a high-capacity computer, relatively low precision (compared with gyroscopes with rotor electric suspension and the magnetic-resonance gyroscope), as well as relatively high cost of mass production of high-quality mirrors.

Inertial navigation systems usually include three ring laser gyroscopes and three accelerometers situated in space at a 90 degree angle, a minicomputer, power supply devices and data input-output devices with display. The basic work of creating laser inertial navigation systems in the United States is being done by the firms of Honeywell, Litton and Singer. For example, Honeywell manufactured the H-423 system for the American F-20 Tigershark fighter and the Swedish Grippen, it is manufacturing an inertial navigation system for the AV-8B aircraft and developing one for the F-15 Eagle tactical fighter. Litton created and is supplying the LTN-90 and LTN-92 inertial navigation systems to civil aviation and similar systems are being developed for the F-14 Tomcat and A-6E Intruder. A contract was concluded with this same firm for production of the LN-93 inertial navigation system for the new F-15E fighter, and it is also proposed to install it in the C-130 Hercules military transports, the RF-4C reconnaissance aircraft and somewhat later HH-60A helicopters and EF-111 Raven EW aircraft. The foreign press notes that a feature of the airborne laser inertial navigation systems already created is their high reliability and relatively high position-finding accuracy equal to 1.8 km in one hour of flying.

It is also reported that similar inertial systems based on ring laser gyroscopes are planned for development for the future Midgetman ICBM and cruise missiles. In addition, some American firms are concentrating efforts on creating a new generation of laser inertial navigation systems with higher accuracy in determining the position of flying craft. These systems, which have been designated Trilog, are characterized by lesser dimensions and weight and will be a monobloc design.

Great Britain, France, the FRG, Italy and Canada are working on problems of inertial navigation using ring laser gyroscopes in addition to the United States. For example, the British firms of Ferranti and British Aerospace received an order for developing a laser inertial navigation system for the new EH-101 helicopter and the Tornado tactical fighter. It is assumed that gyroscopes of this inertial navigation system will have perimeters of 30 or 43 cm and their reliability will be at least 3,000 hours. The firms propose to begin series production of the inertial navigation system based on a ring laser gyroscope with quadruple-mirror resonator, and by 1990 it is planned to create the Triada inertial navigation system with triple-mirror resonator and magneto-optical mirrors.

In France the firm of SFENA intends to use a gyroscope it developed with a 33-cm optical path length in an inertial navigation system for the French version of a future European fighter. This firm concluded a contract to create a laser inertial navigation system with gyroscope perimeter of 12 cm for the European Ariane delivery vehicle and in cooperation with the firm of Kruse proposed to manufacture an inertial navigation system for the future PAH-2 combat helicopter being developed jointly by France and the FRG.

At the present time development work is being done abroad to create inertial navigation systems based on laser **gyroscopes with fiber-optic light guide** or based on fiber-optic gyroscopes. The action of such a gyroscope is

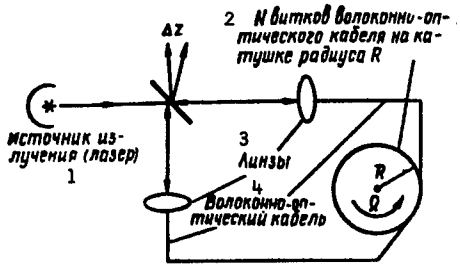


Fig. 2. Principle of operation of laser gyroscope with fiber-optic light guide:

Key: 1. Radiation source (laser)
2. *N* turns of fiber-optic cable on spool of radius *R*
3. Lenses
4. Fiber-optic cable

based on the very same effect as that of the ring laser gyroscope. The main distinctions are that the fiber-optic loop is a passive element inasmuch as the radiation source is located outside of it and the value being measured is not the difference of frequencies of two beams but the difference of their phases. This effect is observed in a ring interferometer in which two beams from one radiation source propagate toward each other along an identical closed path and then interfere (Fig. 2). When such a device rotates at a certain angular velocity the interference bands observed on the screen will shift by the corresponding value. This occurs because one beam propagates in the direction of rotation and the other in the opposite direction and so the beams' phases change independently, which leads to a shift of the interference bands. If the laser beams pass through a fiber-optic loop n times before interference, the band shift also increases n times, which is important in measuring low velocities of rotation. Consequently the use of fiber-optic light guides in a ring interferometer substantially simplifies calibration and increases sensitivity to rotation at low angular velocities.

Judging from foreign press reports, at the present time a number of firms in the United States and other NATO countries (FRG, France, Great Britain) have created prototypes of laser gyroscopes with fiber-optic light guide. The principal advantages of such gyroscopes compared with ring laser gyroscopes are considered to be lesser weight and volume as well as the absence of a need for closer tolerance machining (there are no mirrors). In addition, they do not have a capture area at low velocities of rotation leading to loss of sensitivity and are more technologically efficient with mass production.

Martin Marietta in the United States developed a three-axle gyroscope 25.4x25.4x25.4 mm in size. The FRG has tested a prototype of a gyroscope with optical fiber length of 1,000 m, intended for use in aircraft. British Aerospace developed a fiber-optic gyroscope for guided missiles which, according to firm specialists, is cheaper and begins operating almost instantaneously after launch although it has lesser accuracy than the ring laser gyroscope. A light guide spool 300 m long surrounding a laser camera is the basis of such a gyroscope.

It is also reported that the United States is continuing research on joint use of NAVSTAR users' equipment with inertial navigation systems. It is assumed in particular that such a comprehensive system can be created in the early 1990's based on inertial equipment with fiber-optic light guide.

6904

U.S. Naval Aviation

18010022h Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 8, Aug 87 (signed to press 6 Aug 87) pp 45-53

[Part one of article by Capt 1st Rank A. Rodin]

[Text] An important place is set aside for the Navy within the scope of the American strategy of "direct confrontation" and the strategic concept of "forward lines." The Navy is a versatile branch of the Armed Forces with various arms intended for accomplishing an entire set of operational-strategic missions in ocean, sea and continental theaters of military operations and in wars varying in scope and nature.

Nuclear-powered missile submarines, ship striking forces and multirole carrier forces plow the waters of the Atlantic, Pacific and Indian oceans and the Norwegian, Mediterranean and Arabian seas with the objective of ensuring the American naval presence, increasing international tension and carrying out aggression against independent countries.

Many missions facing U.S. naval forces are assigned to aviation, a naval arm intended for participation in fleet combat actions in ocean and sea TVD [theaters of military operations] and for supporting Marine and Army units [soyedineniye and chast] operating in coastal sectors with both conventional and nuclear weapons.

Naval Aviation includes fleet and Marine aviation. Fleet aviation is subdivided in turn into carrier-based and land-based aviation. The fighting strength of carrier-based aviation approaches 48 percent of the total strength of aircraft and helicopters, land-based aviation has 9 percent and Marine Aviation has 43 percent. According to foreign press data, Naval Aviation numbers up to 5,600 aircraft and helicopters, of which there are some 2,500 in combat aviation, 2,400 in auxiliary aviation, and approximately 700 in reserve units. In addition, the Naval Aviation depot reserve at Davis-Monthan Air Force Base (Arizona) consists of 1,000 aircraft and helicopters, around half of which can be used in an emergency situation.

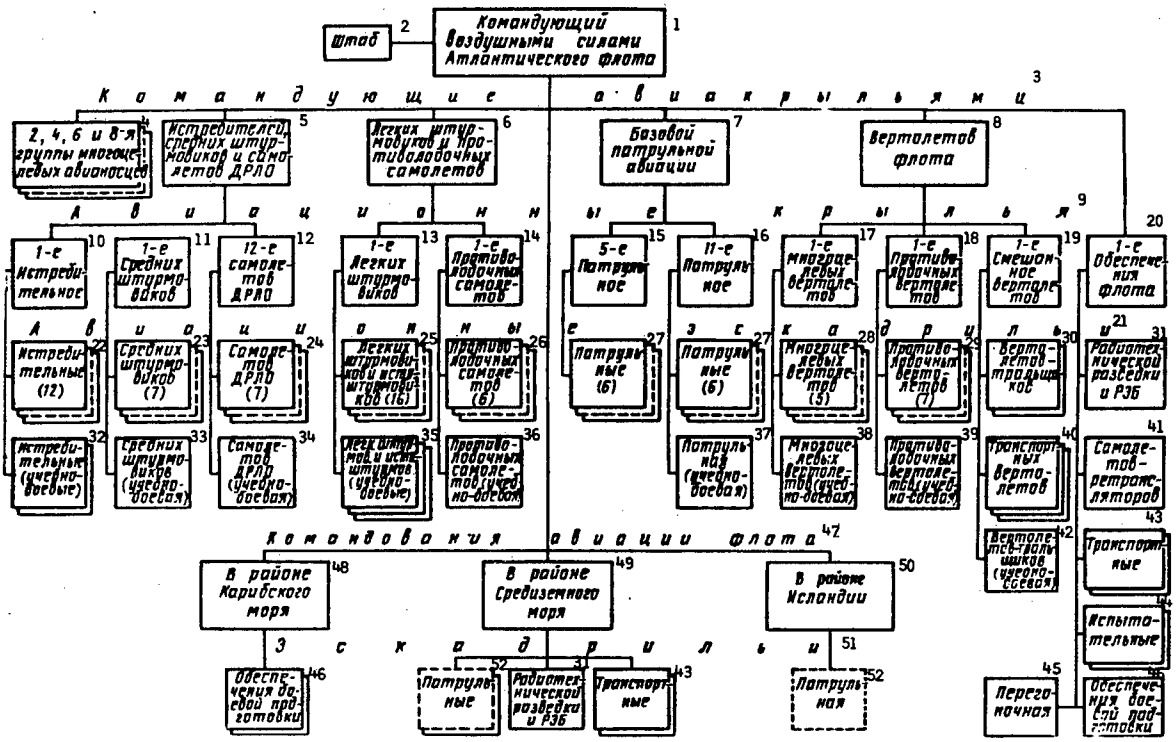


Fig. 1. Organization of Atlantic Fleet Air Force:

Key:1. Commander Atlantic Fleet Air Force 2. Staff 3. Air wing commanders 4. Multirole carrier groups 2, 4, 6 and 8 5. Fighters, medium attack aircraft and AEW [airborne early warning] aircraft 6. Light attack aircraft and ASW [antisubmarine warfare] aircraft 7. Land-based patrol aviation 8. Fleet helicopters 9. Air wings 10. 1st Fighter 11. 1st Medium Attack 12. 12th AEW 13. 1st Light Attack 14. 1st ASW 15. 5th Patrol 16. 11th Patrol 17. 1st Multirole Helicopter 18. 1st ASW Helicopter 19. 1st Composite Helicopter 20. 1st Fleet Support 21. Air squadrons 22. Fighter (12) 23. Medium attack (7) 24. AEW (7) 25. Light attack and fighter-attack (16) 26. ASW (6) 27. Patrol (6) 28. Multirole helicopters (5) 29. ASW helicopters (7) 30. Mine countermeasures helicopters 31. Electronic intelligence [ELINT] and electronic warfare [EW] 32. Fighter (training) 33. Medium attack (training) 34. AEW aircraft (training) 35. Light attack and fighter-attack (training) 36. ASW aircraft (training) 37. Patrol (training) 38. Multirole helicopters (training) 39. ASW helicopters (training) 40. Transport helicopters 41. Relay aircraft 42. Mine countermeasures helicopters (training) 43. Transport 44. Test 45. Ferry 46. Combat training support 47. Fleet air commands 48. Caribbean area 49. Mediterranean area 50. Iceland area 51. Squadrons 52. Patrol

Naval Aviation has two forms of organization acting in parallel: administrative and operational. The former provides for aircraft subordination to the Atlantic and Pacific fleets and to regular and reserve air wings, groups and squadrons and it provides for combat training, mobilization readiness, manning, personnel duty, logistics, rear services and resolution of other problems of day to day activities. Under the operational organization prescribed for conducting operational training and combat actions air wings, air groups and mixed squadrons are formed which operate from multirole aircraft carriers and bases and are included in Marine expeditionary formations.

The air warfare office of the Navy Staff (Washington, D.C.) has responsibility for developing principles for tactical employment of Naval Aviation, determining the organization and establishment of its units, procuring aviation equipment and armament, personnel training and a number of other matters. The head of this office (authorized category is vice admiral) is a deputy chief of naval operations.

The Marine Corps Staff has an office of naval aviation which elaborates and implements plans for organizational development of Marine Aviation and determines requirements for personnel, equipment and logistical support. The head of the office (a lieutenant general) is a deputy commandant of the Marine Corps.

Immediate direction of fleet aviation is the responsibility of commanders of Atlantic and Pacific fleet air forces (the headquarters are located at the Norfolk, Virginia Main Navy Base and at North Island Naval Air Station, California). They are assistant CIC's of the respective fleets for aviation, and in a special sense are subordinate to the Deputy Chief of Naval Operations (Air Warfare).

Direction of Marine Aviation is exercised by the commanders of Atlantic (Norfolk Main Navy Base) and Pacific (Camp Smith, Oahu, Hawaiian Islands) fleet marine forces through their deputies for aviation.

The **Atlantic Fleet Air Force** includes groups of multirole aircraft carriers, carrier-based and land-based air units [soyedineniye and chast], as well as area fleet air commands (See Fig. 1 on page 22).

Commanders of land-based patrol air wings and fleet aviation in the Western Pacific as well as commanders of carrier air wings are immediately subordinate to the Naval Air Force Commander.

Four groups of multirole carriers (headquarters of the 1st and 7th groups are at North Island near San Diego, the 3d in Alameda, California, and the 5th in Cubi Point, the Philippines), judging from foreign press materials, include seven carriers, of which three are nuclear—CVN 68 "Chester W. Nimitz," CVN 65 "Enterprise" and CVN 70 "Carl Vinson"—and four have conventional power plants—CV 63 "Kitty Hawk," CV 61 "Ranger," CV 41 "Midway" and CV 64 "Constellation."

The *Medium Attack and EW Wing* (Whidbey Island NAS, 97 km north of Seattle, Washington) consists of squadrons of A-6E Intruder attack aircraft and EW aircraft (four EA-6B Prowlers in each).

The *Light Attack Wing* (Lemoore, California) has squadrons of A-7E Corsair-II attack aircraft and F/A-18 Hornet fighter-attack aircraft. In addition, the wing includes the 34th ELINT and EW Squadron and the 5th Test Squadron of land-based aviation.

The *Fighter and AEW Wing* (Miramar, 24 km north of San Diego, California) includes squadrons of F-14A Tomcat fighters and E-2C Hawkeye AEW aircraft as well as the 4th Test Squadron and 1st Fleet Combat Training Support Squadron of land-based aviation.

The *ASW Wing* (North Island) includes squadrons of S-3A Viking ASW aircraft, SH-3H Sea King helicopters, and the SH-2F Seasprite and SH-60B Seahawk multirole helicopters, the 6th Test (Antarctic) Squadron and two transport squadrons of land-based aviation.

The *Commander Patrol Wings* (Moffett Field, 56 km south of San Francisco, California) has subordinate to him the 1st, 2d and 10th patrol wings, each of which includes four squadrons of P-3B and P-3C Orion aircraft. The command also includes the 3d Squadron of TACAMO [Take Charge and Move Out] system relay aircraft.

The *Fleet Air Command Western Pacific* (Cubi Point, the Philippines) accomplishes the very same missions in its area as do the territorial commands which are part of the Atlantic Fleet Air Force. This command includes the 1st Separate ELINT and EW Squadron (forward NAS Agana, Guam), permanently based in the Western Pacific. In addition, it includes two transport squadrons (Cubi Point and forward NAS Agana), a combat training support squadron (Cubi Point) and several patrol squadrons (detachments) stationed at Kadena, Atsugi, and Misawa (Japan), Cubi Point and Diego Garcia naval air stations. These squadrons are with the command for up to six months, after which they are replaced by the very same squadrons from the ASW Wing, Fighter and AEW Wing, and 1st, 2d and 10th patrol wings.

Carrier-based aviation is the striking force of Naval Aviation. Its primary purpose is to destroy naval and shore targets using nuclear and conventional weapons. It is subdivided into attack, fighter, fighter-attack, ASW and reconnaissance aviation depending on missions accomplished.

The Naval Air Force commanders exercise immediate command and control of fleet air units through their deputies, who are the commanders of fighter, medium attack and AEW wings; light attack and ASW wings; fleet helicopter wings; and patrol wings; as well as air commanders in the Iceland, Caribbean and Mediterranean areas.

According to the foreign press, the Naval Air Force, Atlantic Fleet has *four multirole carrier groups* (2d, 4th, 6th and 8th) (headquarters are at the Norfolk Main Naval Base). They presently include the following carriers: nuclear—CVN 69 "Dwight D. Eisenhower" and CVN 71 "Theodore Roosevelt"; with conventional power plant—CV 43 "Coral Sea," CV 67 "John F. Kennedy," CV 60 "Saratoga," CV 59 "Forrestal," CV 66 "America" and CV 62 "Independence" (undergoing repair and modernization in Philadelphia until January 1988). The training carrier "Lexington" has been made part of the fleet training command and is home ported at Pensacola Naval Air Station (Florida).

The *Commander Fighter, Medium Attack and AEW Wings* (Oceana Naval Air Station [NAS] near Virginia Beach, Virginia) has the following subordinate air wings: 1st Fighter, 1st Medium Attack and 12th AEW (they consist of tactical and training squadrons). The fighter wing and medium attack wing are stationed at Oceana NAS and the AEW wing at Norfolk NAS.

A fighter squadron includes 12 F-14A Tomcat aircraft (14 crews), three of which can be refitted to suspend a pod with TARPS [Tactical Air Reconnaissance Pod System] reconnaissance equipment.

A squadron of medium attack aircraft has 10-14 A-6E Intruder attack aircraft (15-17 crews) and 2-4 KA-6D Intruder tanker aircraft.

An AEW squadron consists of four E-2C Hawkeye aircraft.

The *Commander Light Attack and ASW Wings* has two subordinate air wings: 1st Light Attack and 1st ASW (Cecil Field NAS near Jacksonville, Florida). The wings consist of squadrons of A-7E Corsair-II attack aircraft (12 aircraft per squadron), F/A-18 Hornet fighter-attack aircraft (12) and S-3A Viking ASW aircraft (10).

The *Commander Patrol Wings* (Brunswick NAS, 32 km northeast of Portland, Maine) has the 5th (Brunswick) and 11th (Jacksonville) patrol wings subordinate to him, each of which includes six squadrons of P-3B and P-3C Orion aircraft and one training squadron.

The *Commander Helicopter Wings Atlantic* (Jacksonville NAS) has three wings of different types of helicopters subordinate to him: 1st Multirole Helicopter (Jacksonville, five squadrons, each with 12-16 SH-2F Seasprite and SH-60B Seahawk helicopters); 1st Helicopter ASW Wing (Norfolk, eight squadrons, each with eight SH-3D and SH-3H Sea King helicopters); 1st Helicopter Composite Wing (Norfolk), which includes squadrons of mine countermeasures helicopters (12 RH-53D Sea Stallion and MH-53E Super Stallion), squadrons of CH-46F Sea Knight, UH-1N Iroquois, HH-3A Sea King transport helicopters and others.

The Atlantic Fleet Air Force also includes the *1st Fleet Support Wing* (Norfolk), which includes various types of air squadrons: ELINT and EW, TACAMO system relay aircraft, transport, test, fleet combat training support, and ferry.

The *fleet air commands in the Iceland* (Keflavik Air Base), *Caribbean* (Roosevelt Roads, Puerto Rico) and *Mediterranean* (Naples, Italy) *areas* are territorial commands intended for providing basing, combat training and logistical support to air units stationed permanently or temporarily in these areas.

The fleet air command in the Caribbean area includes two combat training support squadrons (Roosevelt Roads Air Base and Guantanamo Air Base, Cuba) from the 1st Fleet Support Wing. In the Mediterranean area are a permanently based ELINT and EW squadron (Rota, Spain), two transport squadrons (Rota and Sigonella, Italy) also from the 1st Support Wing and, in addition, two patrol squadrons (Rota and Sigonella) assigned from the 5th or 11th patrol wing. One patrol squadron from the 5th or 11th patrol wing is based at Keflavik Air Base (Iceland). As a rule, squadrons (detachments) are assigned to the area fleet air commands for a period of up to six months, after which they return to their own air wings.

The **Pacific Fleet Air Force** includes groups of multirole aircraft carriers, carrier-based and land-based air units as well as the fleet air command in the Western Pacific (See Fig. 2 on page 25).

Attack aviation is the primary strike component of carrier-based fleet aviation. The deck-based A-6E Intruder and A-7E Corsair-II attack aircraft (13 and 20 squadrons respectively) in its order of battle are nuclear weapon platforms.

Fighter aviation is intended chiefly for air defense of ship forces at sea and for escorting attack aircraft when they deliver bombing and strafing strikes. Its order of battle includes 22 squadrons equipped with F-14A Tomcat fighters.

Fighter-attack aviation is represented by F/A-18 Hornet aircraft (ten sqaudrons) capable of accomplishing missions both of delivering strikes against sea and ground targets as well as providing air defense for ships of a carrier striking force (AUG). At the present time they are replacing the A-7E Corsair-II attack aircraft.

ASW aviation accomplishes missions of hunting and destroying submarines within the carrier striking force's antisubmarine defense system. Deck-based aviation has 11 squadrons of S-3A and S-3B Viking aircraft, 13 squadrons of SH-3D and SH-3H Sea King helicopters, six squadrons of SH-2F Seasprite multirole helicopters and four squadrons of SH-60B Seahawk multirole helicopters.

Reconnaissance aviation is intended for hunting, detecting, transmitting data on the enemy, vectoring attack and fighter aviation, performing ELINT and employing electronic countermeasures in the interests of carrier striking forces. It includes detachments of RF-14A Tomcat reconnaissance aircraft (30 F-14A Tomcats from fighter squadrons are adapted for suspending a pod with TARPS reconnaissance equipment), 13 squadrons of E-2C Hawkeye AEW aircraft and 11 EW squadrons equipped with EA-6B Prowler and EA-3B Skywarrior aircraft (a total of around 80 aircraft).

Under the administrative organization, air wings and squadrons of carrier-based aviation are based at shore air bases and engage in combat training of aircraft crews, subunits and units of the same air arm. Operational formations—*air wings*—are formed from them and earmarked for operations from carriers. They usually arrive aboard the ships when the latter put to sea. When carriers are a part of forward naval groupings air wings are continuously aboard them. When the carrier returns to base the aircraft fly to their air base of permanent assignment.

An air wing based on a carrier usually includes the following squadrons: three attack squadrons, two fighter squadrons, two squadrons of ASW aircraft and helicopters, and a squadron of AEW and EW aircraft. Aerial refueling is provided by a detachment of KA-6D Intruder tanker aircraft as well as a unit of A-6E Intruder tactical aircraft with suspended tanks (Table 1). The total personnel strength of an air wing is over 2,500 persons.

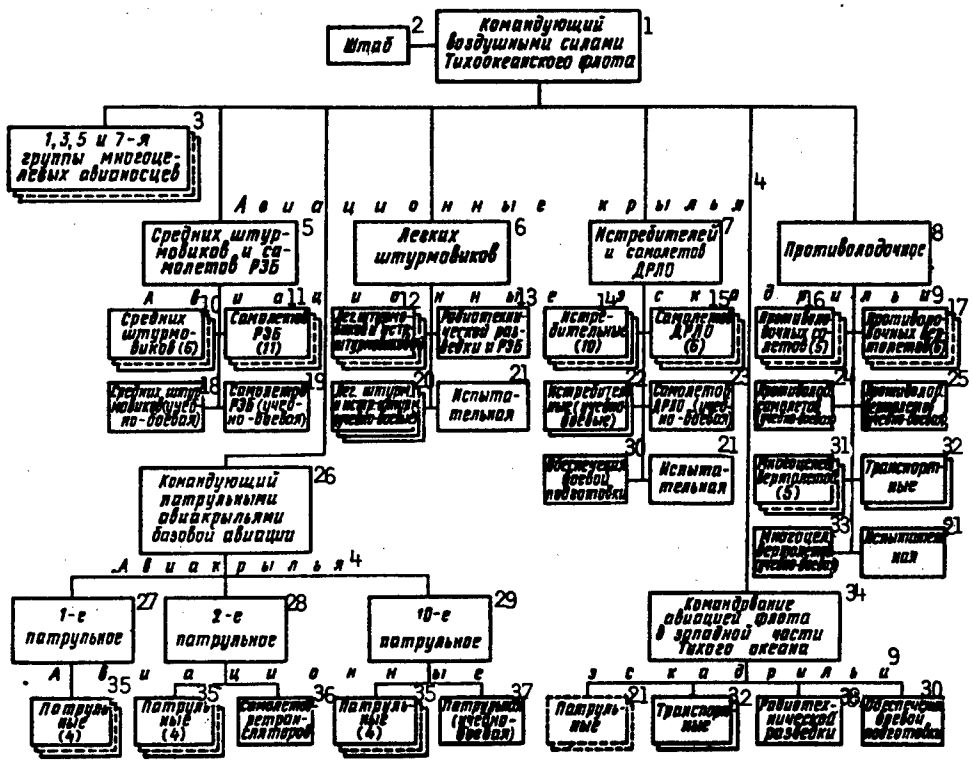


Fig. 2. Organization of Pacific Fleet Air Force:

Key:
1. Commander Naval Air Force Pacific Fleet
2. Staff
3. 1st, 3d, 5th and 7th multirole carrier groups
4. Air wings
5. Medium attack and EW aircraft
6. Light attack aircraft
7. Fighters and AEW aircraft
8. ASW
9. Air squadrons
10. Medium attack (6)
11. EW aircraft (11)
12. Light attack and fighter-attack (14)
13. Electronic intelligence and EW
14. Fighter (10)
15. AEW aircraft (6)
16. ASW aircraft (5)
17. ASW helicopters (6)
18. Medium attack (training)
19. AEW (training)
20. Light attack and fighter-attack (training)
21. Test
22. Fighter (training)
23. AEW (training)
24. ASW (training)
25. ASW helicopter (training)
26. Commander Patrol Wings
27. 1st Patrol
28. 2d Patrol
29. 10th Patrol
30. Combat training support
31. Multirole helicopter (5)
32. Transport
33. Multirole helicopter (training)
34. Fleet air command in Western Pacific
35. Patrol (4)
36. Relay aircraft
37. Patrol (training)
38. Electronic intelligence

Table 1 - Type Air Wing Order of Battle

Types of aircraft and helicopters	Number of squadrons—aircraft or helicopters
A-6E Intruder	1—10
A-7E Corsair-II	2—24
F-14 Tomcat	2—24
E-2C Hawkeye	1—4
EA-6B Prowler	1—4
S-3A Viking	1—10
SH-3H Sea King	1—6
KA-6D Intruder	1*—4
Total: aircraft	80
helicopters	6

*Tanker aircraft detachment

According to foreign press information, the fleet aviation fighting strength is 13 air wings (1st, 2d, 3d, 5th, 6th, 7th, 8th, 9th, 11th, 13th, 14th, 16th and 17th). Activation of one more air wing is concluding. It will be deployed aboard the new nuclear carrier CVN 71 "Theodore Roosevelt," handed over to the Navy late last year. The Pentagon is taking vigorous measures to improve the aircraft pool and expand the range of missions to be accomplished by Naval Aviation. For example, a new modification of the A-6F Intruder attack aircraft fitted with digital microprocessors, with fire control and communications systems, and with the NAVSTAR satellite navigation system has been under development since 1985. The power of its engines exceeds that of the A-6E aircraft by almost 30 percent. The A-6F Intruder attack aircraft(*) is armed with Harpoon antiship missiles, HARM antiradar missiles, Maverick air-to-surface guided missiles, guided bombs, and Sidewinder air-to-air guided missiles. These aircraft will begin entering the fleet aviation order of battle in 1988 and it is planned to procure a total of over 220 of them by 1995.

The A-7E Corsair-II light attack aircraft in the fleet aviation inventory are being modernized by the installation of more powerful engines and new on-board fire control equipment to support employment of Maverick guided missiles with a thermal-imaging guidance system. In the opinion of western specialists, these measures permit keeping the tactical capabilities of the A-7E Corsair-II aircraft at a high enough level until their replacement by the F/A-18 Hornet fighter-attack aircraft during 1987-1990.

The number of new generation F/A-18 Hornet aircraft which can be employed in attack and fighter versions is increasing in the fleet aviation order of battle. As the foreign press notes, it takes no more than one hour to refit one version to another aboard a carrier.

Typical armament of the F/A-18 aircraft in the attack version consists of Harpoon, HARM and Maverick missiles, guided bombs, Sidewinder missiles and a 20-mm cannon. The aircraft's radar provides a surface scan of the earth (water), acquisition and tracking of ground and naval targets, and nap-of-the-earth flying. As a fighter-interceptor the aircraft is fitted with 4-6 Sidewinder and Sparrow missiles. In an air scan mode its radar allows the search, lock-on and simultaneous tracking of up to ten airborne targets and the issue of weapon employment data. Some F/A-18A Hornets are refitted for suspending a pod with TARPS reconnaissance equipment for reconnaissance missions.

During March-April 1986 F/A-18 Hornet fighter-attack aircraft from the carrier "Coral Sea" took part in combat actions for the first time during raids against ships and shore targets of Lebanon. In the assessment of American specialists, the aircraft's tactical capabilities for engaging ground and airborne targets are 3-4 times higher than those of F-4S Phantom-II aircraft.

According to foreign press data, it is planned to procure over 720 F/A-18 Hornet aircraft (counting Marine Aviation) up to the mid-1990's and equip up to 40 tactical and reserve squadrons with them.

At the present time it is planned to begin work of modernizing the F-14A Tomcat fighter, during which more powerful engines and new electronics will be installed in the aircraft, designated the F-14D Super Tomcat. This aircraft's tactical capabilities of combating small, low-flying supersonic targets also will increase. It is planned to procure over 300 such aircraft by the mid-1990's.

Work has been under way since 1986 to improve the S-3A Viking ASW aircraft. The modernized S-3B will be armed with the Harpoon antiship missile, which will allow it to combat enemy surface ships independently. It is planned to refit some 160 aircraft of this type by 1990.

A new scanning-radar antenna is being installed aboard E-2C Hawkeye AWACS aircraft, and other airborne equipment is being improved. American specialists believe that this will permit bringing their capabilities up to those of the Air Force's E-3A Sentry AWACS aircraft and lengthening their presence in the order of battle up to the year 2000.

The EA-6B Prowler EW aircraft also are being modernized by replacing the airborne communications jammer with the new AN/ALQ-149 with a broader frequency range. The beginning of jammer tests is expected in 1987.

The number of SH-60B Seahawk multirole helicopters equipped with an on-board reconnaissance and target designation system is being increased in the fleet aviation order of battle at the present time. The system provides over-the-horizon detection of surface targets

and the issue of target designations to a ship carrying the Harpoon antiship missile for firing missiles to a maximum range of up to 130 km. Beginning in 1988 it is planned to arm these helicopters with the Penguin antiship missile (with a range of fire of over 20 km), which will permit them to independently combat enemy surface ships. The question of fitting Seahawk helicopters with Harpoon missiles also is being studied. The foreign press notes that by the mid-1990's they will be based on 100 combatant ships, for which it is planned to additionally procure some 80 helicopters of this type.

The SH-2F Seasprite multirole helicopters (over 100) in the naval inventory are undergoing modernization which includes replacement of engines with more powerful engines and installation of new on-board systems including sonobuoys. The improved helicopters will be based on 80 ships of the regular Navy and the ready reserve up to the end of the 1990's.

Beginning in 1988 it is planned to begin replacing SH-3H Sea King antisubmarine helicopters which are part of multirole carrier wings with SH-60F Seahawk helicopters equipped with the AN/AQS-13F dipping sonar, a new computer and Mk 50 torpedoes. In the opinion of American specialists, use of these helicopters will permit improving the defense of carrier groups against modern submarines in the near antisubmarine zone. It is planned to deliver up to 170 SH-60F Seahawk helicopters to the Navy by 1995.

The entry of new types of aircraft and helicopters into carrier aviation and the considerable modernization of the existing air inventory made it necessary to re-evaluate the make-up of the air wing of modern carriers and the nature of its tactical employment in sea theaters of military operations. In connection with this the Navy command developed three new type variants of the air wing order of battle: a multirole wing and two attack wings—medium and long range (Table 2).

Table 2 - New Type Variants of Deck-Based Air Wing Order of Battle

Types of aircraft and helicopters	New type variants (number of squadrons—aircraft or helicopters)		
	First (multirole)	Second (medium range attack)	Third (long range attack)
A-6E and A-6F Intruder	1—16	1—12	2—24
F/A-18 Hornet	2—20	4—48	
F-14A and F-14D Tomcat	2—20		2—24
E-2C Hawkeye	1—5	1—4	1—5
EA-6B Prowler	1—5	1—4	1—5
S-3A and S-3B Viking	1—10		1—10
SH-3H Sea King, SH-60F Seahawk	1—8	1—6	1—8
KA-6D Intruder	1*—4	1*—4	1*—4
Total: aircraft	80	72	72
helicopters	8	6	8

*Tanker aircraft detachment.

American specialists emphasize that the **multirole variant** best meets both present-day as well as future demands for conducting naval warfare. The inclusion of F/A-18 Hornet fighter-attack aircraft in an air wing gives it great flexibility in employment. Depending on the combat situation taking shape in any theater of military operations the command can increase the wing's capabilities for destroying enemy naval forces at sea or for providing air support to troops in coastal sectors (in this case the F/A-18's are used as attack aircraft), or along the line of a substantial increase in air defense of a carrier striking force by using the Hornet aircraft as fighters. In any version the F/A-18 Hornet considerably surpasses the A-7E Corsair-II attack aircraft and F-4S Phantom-II fighters it is replacing in maneuverability; accuracy of engaging ground, sea and airborne targets; reliability; and maintainability.

The Navy command plans to have ten air wings of this type, five each in the Atlantic and Pacific fleet air forces.

American specialists believe that the **medium range attack wing** will be effective in actions against enemy ship forces and in providing air support to ground troops in coastal sectors at a distance of up to 500-700 km from the carrier. Such wings already have been activated for the carriers "Coral Sea" and "Midway." After these carriers are decommissioned (planned to take place during 1992-1994) their wings will be reorganized as multirole wings for employment aboard new carriers.

The **long range attack wing** is intended for delivering strikes under adverse weather conditions and at night against targets 1,000 km or more from the carrier. In 1987 it is planned to accommodate one air wing aboard each of two carriers: the "Kennedy" (part of the Atlantic Fleet Air Force) and the "Ranger" (Pacific Fleet).

Air wings will be created with the new make-up as the plan for procuring F/A-18 Hornet aircraft is implemented (Table 3).

Table 3 - Activation Periods for New Types of Air Wings

Carriers	Type wing	Wing number	Period of wing activation
"Constellation"	First	14	1984
"Coral Sea"	Second	13	1985
"Midway"	Second	5	1986
"Theodore Roosevelt"	First	-	1987
"America"	First	1	1987
"John F. Kennedy"	Third	3	1987
"Ranger"	Third	9	1987
"Independence"	First	-	1988
"Dwight D. Eisenhower"	First	7	1988
"Saratoga"	First	17	1988
"Abraham Lincoln"	First	-	1989
"Chester W. Nimitz"	First	8	1989
"Kitty Hawk"	First	2	1990
"Forrestal"	First	6	1991
"George Washington"	First	-	1991
"Carl Vinson"	First	15	1992
"Enterprise"	First	11	1993

(To be concluded.)

Footnotes

*See *Zarubezhnoye Voyennoye Obozreniye*, No 6, 1986, pp 56-57 for more detail on the attack aircraft—Ed.

6904

Japanese Unmanned Submersibles

18010022i Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 8, Aug 87 (signed to press 6 Aug 87) pp 53-55

[Article by Capt 1st Rank B. Sakharov under rubric "At the Readers' request"]

[Text] Unmanned submersibles have been developed abroad widely from the mid-1970's. By 1985 there were some 800 of them, of which up to 450 were being used in support of oil and natural gas production at sea and approximately 350 were being used for military purposes (hunting and destroying mines; reconnaissance-sabotage and antisabotage operations; survey and inspection of underwater installations, cables, military pipelines and so on). In the opinion of foreign specialists, the overall number of unmanned submersibles will increase to 1,200 by 1990.

Japan is creating unmanned submersibles for military and industrial purposes along with the United States, France, Great Britain, Sweden and other capitalist countries. They differ slightly from each other and have lesser weight and dimensions compared with manned submersibles. This simplifies their operation and does not require creation of special platform vessels. Unmanned submersible which are powered and controlled by cable can operate continuously for an unlimited time. It is almost 100 times cheaper to create and operate them than manned submersibles. By the mid-1980's a trend was apparent abroad toward creating small (weighing 30-50 kg) and inexpensive (costing around $30,000) unmanned submersibles which could successfully compete with manned submersibles and diving systems in inspection work and simple underwater technical work for brief dives and lengthy stays under water. They preclude risk to the life of operators when operating under conditions of a mine threat, radioactive contamination and so on. These features then explain their rapid development in recent years.

The MURS 100 (see photo [photo not reproduced]) is one of the first Japanese models.

The ellipsoid hull is made of aluminum alloy. Its front portion has a spherical transparent acrylic cupola behind which a color TV camera and electronic gear are installed. The hull and acrylic cupola are designed for a submergence depth down to 100 m. The TV camera is fastened on a traversing-tilting arrangement which expands its field of view. Two lights are mounted on the submersible's sides and two propulsion motors with propellers are mounted behind them (closer to the stern). The rear part of the hull has a stabilizer and cable lead-in. The cable is supplied with floats giving it zero buoyancy in a section some 25 m long. A shackle is welded to the upper part for convenience in launching and recovering the vehicle. The unmanned submersible comes to rest on the bottom on a sled frame made of pipes attached to the lower part.

The MURS 300 and MURS 300 Mk 2 were developed later on the basis of the MURS 100 for operating at depths down to 300 m (see table). It is apparent from the table that weight and consumed power were considerably reduced in the last modification of the MURS unmanned submersible.

Principal Characteristics of Unmanned Submersibles

Designation	Submergence depth, m	Principal dimensions, m: length, beam, height	Weight in air, kg/positive buoyancy	Speed, knots/motor power, kw	Cable dimensions: length, m/diameter, mm	Equipment
MURS 100	100	2.25, 1.88, 1.25	900/6	2/30	160/26	TV camera, lights,manipulators
MURS 300	300	2.73, 2.06, 1.85	2,600/10	2/60	500/26	TV camera, lights, manipulators
MURS 300 Mk 2	300	0.96, 0.76, 0.63	180/·	2.5/10	·/·	TV camera, lights, manipulators, fathometer, obstacle detection sonar
Dolphin-3K	3,300	2.85, 1.94, 1.9	3,300/10	3/55	*/·	TV cameras, lights, manipulators, obstacle detection sonar, photo camera, gripping device, depth indicator, navigation sonar, current meter
JTV-1 and -2	200	0.52, 0.64, 0.5	43/1	2/0.5	200/16	TV camera, lights, fathometer
DLT 300	200	0.69, 0.62, 0.52	47/1	1-2/1.2	200/25	Color TV camera, lights
RTV 100	100	0.85, 0.55, 0.35	25/1	2/0.65	100*/12.5	Color TV camera, lights, depth indicator
RTV 400	400	0.75, 0.77, 0.55	120/1	·/·	450/26	Color TV camera, lights
Hornet-500	400	1.2, 0.96, 0.56	120/1	3/3	800*/50	Color and black-and-white TV cameras, lights, depth indicator, gyrocompass

*Fiber-optic cable.

The next generation of unmanned submersibles in Japan were those developed in the late 1970's and early 1980's. These are small vehicles for a depth of 100-500 m (data on them are given in the table). The deepest-diving of them is the Dolphin-3K (a depth of 3,300 m), intended for preliminary survey of seabed sectors before using the Shinkai-2 manned submersible. Its equipment includes a color TV camera, black-and-white TV camera, five 500 watt lights, one 250 watt light, a 35-mm photo camera, manipulator, gripper and cutter. An obstacle avoidance sonar, fathometer, depth indicator, gyrocompass and navigation sonar are installed in the submersible for safe operation. The vehicle is automatically kept at given distances above the bottom and on course. It moves using hydraulic motors: 2x15 hp propulsion motors at a forward speed of 3 knots and rearward speed of 2 knots, 2x9 hp vertical motors with upward and downward speed of 1 knot and 2x9.5 hp log motors with a speed of 1.5 knots.

The Dolphin-10K (working depth of 10 km) is being developed for conducting rescue operations when operating the Shinkai-6 manned submersible (submergence depth down to 6,000 m) being built. The Dolphin-10K will have a fiber-optic cable, color and black-and-white television cameras, photo cameras and other equipment. Maximum speed is 3 knots and its creation costs four billion yen.

The JTV-1 and JTV-2 as well as others intended for inspecting pipelines and electric cables on the seabed, dam walls, and other underwater works are standard small unmanned submersibles.

The RTV100, RTV400 and Hornet-500 unmanned submersibles have fiber-optic cables permitting the transmission of a large volume of data including high-quality

color television imagery. The cable diameter is considerably reduced (7-12.5 mm), which leads to a decrease in hydrodynamic resistance and a reduction in consumed power of the vehicles' propulsion devices. It competes successfully in weight and cost with the small American Mini-Rover unmanned submersibles (a weight of 22.7 kg and a cost of $28,500).

One of the latest developments, completed in 1984, is the Hornet-500 unmanned submersible for geological and biological surveys, inspecting underwater works and performing other operations at depths down to 500 m. Its hull is made from two hemispheres joined by a cylinder. The hull material is aluminum alloy. Two vertical propulsion units with 80 watt 100 volt dc electric motors as well as two horizontal propulsion units with 120 watt 100 volt dc electric motors are installed in the unmanned submersible. The spherical parts of the hull (diameter 430 mm and wall thickness 5 mm) have acrylic portholes (90 degree angle of view, thickness 15 mm). The cylindrical part of the hull has a length of 160 mm, a diameter of 200 mm and a thickness of 10 mm. The fiber-optic cable has a wide frequency bandpass (6 MHz), and attenuation is 0.5 db/km. The resolution of the color television camera (400 lines) requires a minimum subject illumination of 80 lux, achieved by the use of four 300 watt and two 150 watt halogen lights. A black-and-white TV camera with low photocathode illumination (0.3 lux) is installed in the front hemisphere in addition to the color TV camera. Both cameras are mounted on a traversing-tilting device with remote drive.

The Hornet-500 unmanned submersible set includes a display-computer, control panel with TV monitors, power supply unit and cable winch. The outboard portion consists of the submersible, thin primary cable (diameter 7 mm, length 800 m) and a buoyant cable 50 m long.

The unmanned submersible control system includes three microcomputers which provide control of the four propulsion units, depth stabilization for standoff from the bottom, maintenance of course, and transmission of digital telemetry.

The Hornet-500 unmanned submersible set is accommodated in transport containers; this includes a cable drum and launching-recovery arrangement. It can be deployed from floating craft of nonspecialized construction.

In addition to small tethered unmanned submersibles (to depths of 100-500 m) and deep-diving unmanned submersibles (to 3,300 and 6,000 m), Japanese specialists plan to develop a self-contained unmanned submersible robot for prospecting-survey operations. They believe that a small robot submersible with great endurance can be created through the use of a micromodular component base and self-contained sources with high specific energy characteristics. In their opinion such a submersible will make use of artificial intelligence components permitting detection, classification and identification of a target, decisionmaking under changing conditions of the surrounding medium, and performance of many other tasks without man's help.

6904

Canadian Small Submarine Reactor

18010022j Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 8, Aug 87 (signed to press 6 Aug 87) p 56

[Article by Capt 1st Rank V. Kipov]

[Text] The combat effectiveness of diesel submarines constantly depends on the need to periodically recharge storage batteries. For this submarines must come up to periscope depth where it is possible for the diesel to operate under water using the special RDP [snorkelling] device, which reduces their operating concealment and increases the likelihood of detection. According to foreign press information, the ratio of time spent snorkelling to time of submerged operation as a whole in different phases of combat mission execution (passage to an area, patrolling a given area) is 7-20 percent for modern submarines, i.e., diesel submarines spend 2-5 hours each day on recharging. It is also reported that when patrolling at a speed of 2-4 knots they can be in a submerged condition for up to 3-4 days, but then their storage batteries have discharged by approximately 80 percent and recharging will require considerably greater time. In addition, the limited nature of diesel submarine power reserves does not permit their use in ice-covered arctic areas.

To eliminate these drawbacks a number of western countries are performing research aimed at developing combination ("hybrid") power plants in which it is proposed to supplement traditional diesel generators and storage batteries with anaerobic (independent of atmospheric air) energy sources. In the opinion of foreign specialists, fuel cells (being developed in particular in the FRG), Stirling engines (Sweden), and diesels with a closed operating cycle (Italy, Japan) can become such anaerobic energy sources.

Specialists of the Canadian firm of Energy Conversion Systems are developing a self-contained supplementary power plant for submarines—a small nuclear reactor based on the Slowpoke low-power slow-neutron research reactor. Its diameter together with biological shielding must not exceed 3.7 m, the electric capacity must be 100-400 kw, and it must have an operating period of up to 1,000 days when running at full power. According to the concepts of Canadian specialists, such a reactor will give submarines a theoretically unlimited under-ice operation (within limits of endurance). It is also noted that such a plant could fully provide for the energy needs

of submersibles and midget submarines. With regard to submarines with a displacement of 2,000 tons or more, the capabilities for a sufficiently fast passage to the combat mission execution area and for maneuvering when launching an attack will continue to be determined by the energy capacity of storage batteries and the output of diesel generators.

Submarines which will be fitted with small nuclear reactors essentially will remain diesel submarines. Therefore the firm's specialists emphasize that the increased safety of the reactor being developed as well as its microprocessor control, which requires only minimal operator participation, will not call for changes in the structure of submarine base support. The firm will deliver these units in the form of a separate section completely ready to be cut into the hulls of existing submarines or ready for assembly of submarines being built.

It is planned to manufacture a reactor prototype in 1988. By agreement with the French firm of Comex, it will be installed aboard the 290 ton research submarine "Saga-1," which will conduct a number of tests including operation in ice-covered areas. In case of success, test results can influence directions of further development of naval submarines not only of Canada, but also of other NATO countries. In addition to Comex, interest has been shown in this development by the British firm of Vickers, the Dutch firm of RDM and the West German firm of Thyssen Nordseewerke.

6904

UK Area Study

18010022k Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 8, Aug 87 (signed to press 6 Aug 87) pp 69-76

[Article by Lt Col I. Gavrilov and Yu. Antonov: "Great Britain (Physical-Geographic Conditions, State Organization, Economy, Infrastructure Elements, Armed Forces)"]

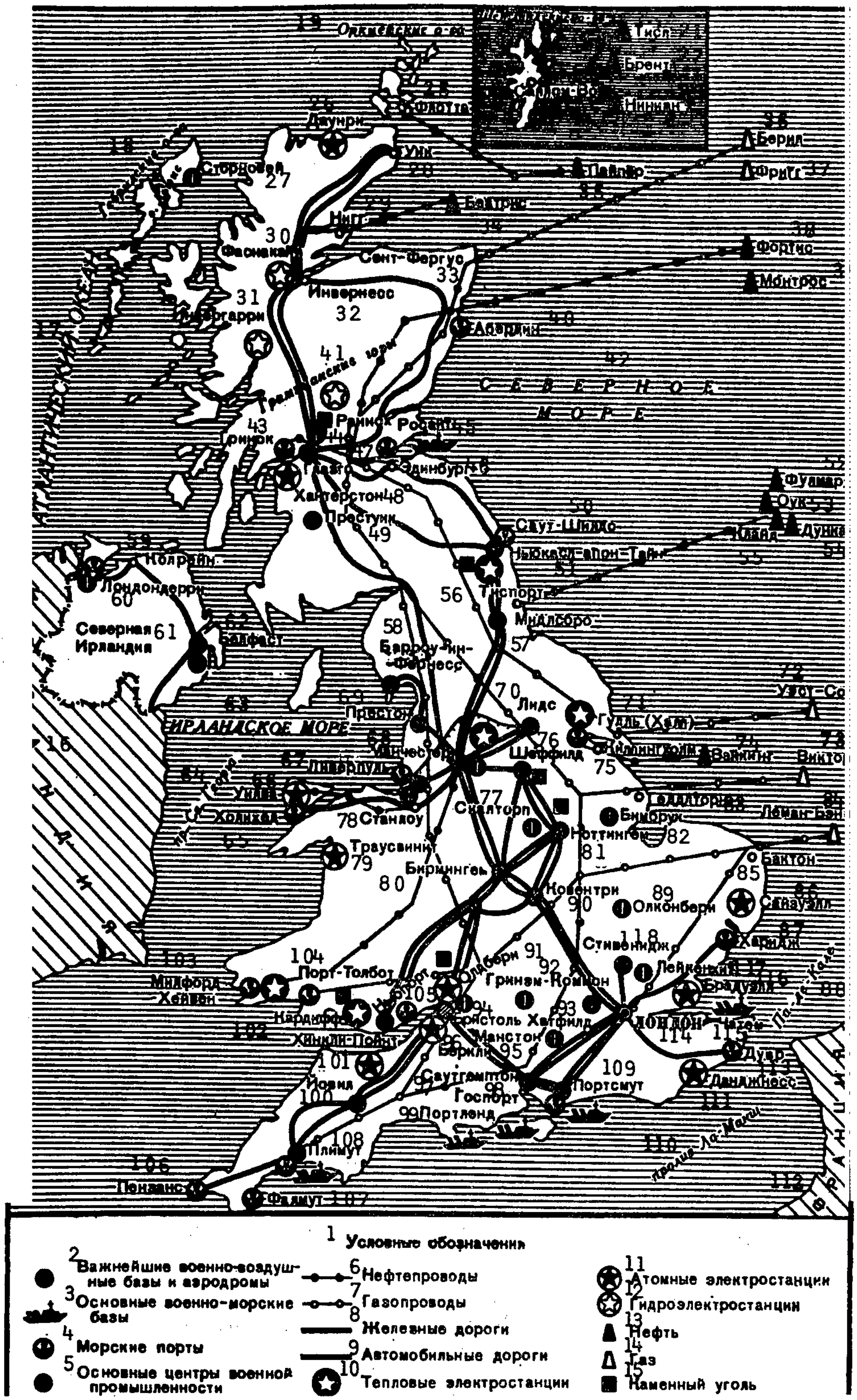
[Text] Great Britain (the United Kingdom of Great Britain and Northern Ireland) is a state situated in the British Isles in the immediate vicinity of continental Western Europe (Fig. 1). It is the center of a Commonwealth—a political and economic association of countries and territories which are part of the British Empire (49 independent states and dependent territories of Great Britain, Australia and New Zealand). Relying on accumulated foreign political experience, broad economic and financial ties and armed forces outfitted with modern weapons and combat equipment, Great Britain continues to play an important role in NATO and in a number of other political, economic and military organizations. The following is a key for the map on page 33.

Key:

1. Legend	2. Most important airbases and airfields	3. Main naval bases	4. Seaports
5. Main centers of military industry	6. Oil pipelines	7. Natural gas pipelines	8. Railroads
9. Highways	10. Thermal electric power stations	11. Atomic electric power stations	12. Hydroelectric stations
13. Oil	14. Natural gas	15. Coal	16. Ireland
17. Atlantic Ocean	18. Hebrides Islands	19. Orkney Islands	20. Shetland Islands
21. Thistle	22. Brent	23. Ninian	24. Sallom-Voe
25. Flotta	26. Dounreay	27. Stornoway	28. Wick
29. Nigg	30. Fasnakyle	31. Inveraray	32. Inverness
33. St. Fergus	34. Beatrice	35. Piper	36. Beryl
37. Frigg	38. Forties	39. Montrose	40. Aberdeen
41. Grampian Mountains	42. North Sea	43. Greenock	44. Rannoch
45. Rosyth	46. Edinburgh	47. Glasgow	48. Hunterston
49. Prestwick	50. South Shields	51. Newcastle-upon-Tyne	52. Fulmar
53. Auk	54. Duncan	55. Clyde	56. Teesport
57. Middlesbrough	58. Barrow-in-Furness	59. Coleraine	60. Londonderry
61. Northern Ireland	62. Belfast	63. Irish Sea	64. St. George's Channel
65. Holyhead	66. Wylfa	67. Liverpool	68. Manchester
69. Preston	70. Leeds	71. Hull	72. West Sole
73. Victor	74. Viking	75. Killingholme	76. Sheffield
77. Sculthorpe	78. Stanlow	79. Trawsfynydd	80. Birmingham
81. Nottingham	82. Binbrook	83. Heddlethorn	84. Leman Bank
85. Bacton	86. Sizewell	87. Harwich	88. Strait of Dover
89. Alconbury	90. Coventry	91. Oldbury	92. Greenham Common
93. Hatfield	94. Bristol	95. Manston	96. Berkeley
97. Southampton	98. Gosport	99. Portland	100. Yeovil
101. Hinkley Point	102. Cardiff	103. Milford Haven	104. Port Talbot
105. Newport	106. Penzance	107. Falmouth	108. Plymouth
109. Portsmouth	110. English Channel	111. Dungeness	112. France
113. Dover	114. London	115. Chatham	116. Bradwell
117. Lakenheath	118. Stevenage	119. Lewis Island	

Comprehensive support of the present U.S. leadership's militaristic course and a strengthening of the North Atlantic Alliance makes up the basis of the country's military policy. There is no thought of conducting important international affairs or of national security other than with reliance on nuclear weapons. Interest in preserving its own nuclear arsenal predetermines the government's approach to the problem of reducing nuclear arms. While recognizing in words the importance of concluding an agreement on medium range missiles, Great Britain at the same time continues to surround the approach to it with various reservations. Taking refuge in slogans about the need for a 50 percent cutback in U.S. and USSR strategic offensive arms, Great Britain's military-political leadership fully supports the American Strategic Defense Initiative program.

Physical-geographic conditions. The United Kingdom of Great Britain and Northern Ireland (an area of 244,100 km^2) includes four historical-geographic areas—England, Wales, Scotland and Northern Ireland (Ulster)—which differ in national make-up of the population. They are administratively divided into counties.


Оркнейские о-ва
Флотта
Даунри
Сторновей
Никг
Фаснакайл
Сент-Фергус
Инвернесс
Инвергарри
Абердин
Грампианские горы
Беатрис
Пайпер
Берил
Фригг
Фортис
Монтроз
Брент
Нинниан
СЕВЕРНОЕ МОРЕ
АТЛАНТИЧЕСКИЙ ОКЕАН
Гринок
Глазго
Эдинбург
Хантерстон
Престуик
Саут-Шилдс
Ньюкасл-апон-Тайн
Фуамар
Оук
Дунлин
Колрейн
Лондондерри
Северная Ирландия
Белфаст
Тиспорт
Мидлсборо
Барроу-ин-Фернесс
ИРЛАНДСКОЕ МОРЕ
Престон
Лидс
Гудль (Хам)
Уэст-Сол
Викто
Манчестер
Ливерпуль
Шеффилд
Уилва
Холихед
Станлоу
Скантори
Ноттингем
Теддлторп
Бингбрук
Леман-Бэнк
Траусвинид
Бирмингем
Бактон
Ковентри
Олконбери
Сайзуэлл
Милфорд-Хейвен
Порт-Толбот
Гринхэм-Коммон
Стивенидж
Лейкенхит
Брадуэлл
Кардифф
Хинкли-Пойнт
Бристоль
Манстон
Беркли
ЛОНДОН
Чатем
Дувр
Данджнесс
Йовил
Саутгемптон
Госпорт
Портсмут
Портленд
Плимут
Пензанс
Фалмут
пролив Ла-Манш
Па-де-Кале
ФРАНЦИЯ
ИРЛАНДИЯ
1 Условные обозначения
2 Важнейшие военно-воздушные базы и аэродромы
3 Основные военно-морские базы
4 Морские порты
5 Основные центры военной промышленности
6 Нефтепроводы
7 Газопроводы
8 Железные дороги
9 Автомобильные дороги
10 Тепловые электростанции
11 Атомные электростанции
12 Гидроэлектростанции
13 Нефть
14 Газ
15 Каменный уголь

England (an area of over 130,300 km^2) occupies the southern and middle portions of the island of Great Britain. In addition to small coastal islands, it includes the large Isle of Wight in the English Channel. Wales is located on a peninsula of the same name in the western part of the country, and it includes Anglesey Island and a number of minor islands. Wales has an area of 20,800 km^2. Scotland occupies the northern part of Great Britain, and also includes small islands in coastal waters and the open ocean. The largest of them are the Hebrides, Orkney and Shetland islands. Scotland's area is 78,800 km^2. Northern Ireland is in the northeastern part of the Island of Ireland. Its area is 14,100 km^2. In addition, the United Kingdom includes the Isle of Man in the Irish Sea and the Norman Isles in the English Channel, but they do not belong to any of the aforementioned parts.

On the east Great Britain is washed by the North Sea. The country's south coast is separated from the north of France by the English Channel, the least width of which is around 32 km in the eastern part, the Strait of Dover. The English Channel is shallow, with the minimum depth of the navigable part being 23.5 m. The islands of Great Britain and Ireland are separated by the Irish Sea and by the North and St. George's channels. It is around 230 km between the ports of Liverpool and Dublin, which are on opposite shores of the Irish Sea. The British Isles are washed on the west by the Atlantic Ocean.

The greater portion of the country's territory is characterized by rugged relief. Mountains and elevations of medium height predominate in Scotland, Northern Ireland, Wales and Northern England. Mt. Ben Nevis (1,343 m, Grampian Mountains) is the highest peak in the United Kingdom. Hills 500-600 m high separated by lowlands are found on the Cornwall Peninsula.

The country's climate is oceanic, with moderate temperatures, an abundance of atmospheric precipitation, unstable weather, and frequent strong winds. The mean temperature in January is 3-7 degrees Centigrade and in July 12-17 degrees Centigrade. Precipitation falls evenly throughout the year, increasing slightly only in the fall and winter, and in the southeast in summer and fall. Maximum precipitation is noted in Scotland (in places up to 3,000 mm per year) and the minimum is noted in Southeastern England (600-700 mm), and clouds and fogs are frequent.

The river network is rather dense; rivers are full, nonfreezing in the lowlands, and subject to the effect of sea tides. There are no large rivers here because of the relatively small size of the country's territory, particularly its flatland parts. The two longest rivers, the Thames and Severn, are 334 and 310 km respectively. The largest lakes are in Northern Ireland. Loch Neagh, situated in its eastern part, occupies an area of 396 km^2. The largest of the lakes are used for local water transportation, fishing, water supply of cities, and regulation of river runoff.

Population and state system. The country holds third place in Western Europe (after the FRG and Italy) in size of the population (56.1 million persons). The bulk of the population consists of the English (over 80 percent). Also living in Great Britain are Scots (around 9 percent), Irish (4 percent), and Welsh (approximately 1 percent), and there are sizable groups of Jews and immigrants from Asiatic and African countries. The state language is English. The dominant church is the Anglican Church, with a portion of the residents belonging to the Catholic and Presbyterian churches.

Great Britain is one of the highly urbanized states of the world: almost a third of the total population is concentrated in seven major cities with their suburbs—London (6.8 million residents), Manchester (2.6 million), Birmingham (2.3 million), Glasgow (1.8 million), Leeds (1.7 million), Liverpool (1.4 million) and Newcastle-upon-Tyne (around 1 million). The average population density is 231 persons per square kilometer. The greatest density is found in central and southeastern England (621 persons per square kilometer), and the minimum density is in the Northern Scotland area. In 1986 the country's economically active population comprised 27.8 million persons, including 24.3 million occupied in the economy and over 3.2 million unemployed.

The United Kingdom of Great Britain and Northern Ireland is a parliamentary monarchy. The Sovereign (since 1952 Queen Elizabeth II) is officially the head of state; the power of the Sovereign is considered lifelong and is hereditary. The Sovereign is also the supreme commander in chief of the armed forces and head of the Commonwealth. In reality power is concentrated in the hands of a Cabinet of Ministers (some 20 persons) formed by the ruling party.

Legislative authority belongs to the monarch and Parliament, which consists of the House of Lords (the upper House with more than 1,100 members) and the House of Commons (the lower House with 650 deputies elected for five years).

Several political parties function in the country. The *Communist Party of Great Britain* was founded in 1920. It has some 13,000 members in its ranks. It is guided in its activities by the program of the Communist Party of Great Britain, "Britain's Path to Socialism," the last version of which was approved in 1977. The *Conservative Party of Great Britain* (some 3 million members) is the ruling party. It expresses the interests of the monopolistic bourgeoisie and landed aristocracy. It received an absolute majority of seats in the 1987 Parliamentary elections. The activities of the Conservative government were marked by stepped-up attacks by monopolies against workers' vital interests, anti-trade union measures, repressions against fighters for civil rights in Northern Ireland, and aggressiveness in foreign policy. The leader (M. Thatcher), who is the prime minister, has great influence in the party. Together with the leading grouping consisting of representatives of big bourgeoisie

and aristocracy, the leader decides all the country's most important issues. The *Labour Party* has around 7 million persons including over 6.5 million with rights as collective members (basically trade unions). In 1981 a group of Right Labourites left the party and formed the *Social Democratic Party,* which has more than 50,000 persons and reflects centrist trends. The *Liberal Party* reflects interests of the middle and petty bourgeoisie and of a portion of the intelligentsia. It includes some 200,000 persons. Other parties and organizations of a varying nature also take part in political life.

The largest professional association, the British Trades Union Congress, brings together over 100 trade unions with approximately 9.6 million members.

Economy. Great Britain is among the leading industrial states of the capitalist world. Inferior to the United States, Japan, the FRG and France in size of gross national product [GNP] and volume of industrial production, it is the world's second financial creditor and largest oil exporter in Western Europe. The country holds one of the first places in the West European community in the level of capital concentration. At the present time there are around 30 British companies among the 100 largest European companies. Oil refining, military, electrical engineering and chemical are among the most monopolized sectors of British industry.

Leading financial groups have broad international ties. Great Britain holds second place in the world after the United States in volume of foreign capital investments. At the present time some 80 percent of them are concentrated in developed capitalist countries. The activity of British monopolies abroad contributes to the development of the national economy and a strengthening of the state's political ties.

A high degree of militarization is a distinctive feature of Great Britain's economy. This is reflected in a continuous growth of military expenditures, an intensification of the military direction of research, and an increase in the volume of arms production and export. For example, the country is in second place after the United States in volume of military expenditures per capita. In 1983 this indicator was 435 American dollars (as a comparison it was $962 in the United States, $396 in France and $364 in the FRG). Expenditures for the development of science and technology reached almost 2.5 percent of the GNP in the postwar years. The leading role in their financing belongs to the state, which accounts for over half of overall expenditures for these purposes. Military R&D accounts for around 50 percent of all funds allocated for research. Direct expenditures for military development increased by more than a third during 1981-1985. Great Britain's scientific-technical potential permits the development of modern weapon systems independently and on the basis of cooperation within the framework of the NATO bloc.

In the latter half of 1983 Great Britain's economy entered a phase of a certain animation (after a protracted depression), but economic growth did not lead to the overcoming of all consequences of the crisis of the early 1980's. An underloading of production capacities, a state budget deficit, inflation, and powerful strikes occur. Economic activity in the country depends to a large extent on external markets. The principal items of British export in 1985 were (in percent) industrial equipment (34), oil (21) and chemical commodities (12). Finished industrial products (41), raw materials (around 20) and food (almost 11) predominate in import. Developed capitalist states account for over 80 percent, developing countries 15 percent, and socialist countries a little more than 2 percent of foreign trade turnover.

Raw material and energy resources. Significant deposits of energy raw materials are concentrated chiefly in the British sector of the North Sea (oil, natural gas) and northwestern parts of the country (coal). Ores and nonmetallic mineral raw materials (small amounts) are found primarily on the Cornwall Peninsula. Proven reserves of oil comprise 1.8 billion tons, natural gas 711 billion cubic meters, coal 45 billion tons, iron ore 2.7 billion tons and tin 130,000 tons. The country is fully supplied with energy raw materials. Other kinds are imported to one degree or another.

In the assessment of Great Britain's Ministry of Energy, the maximum level of oil production was reached in 1985 (128.5 million tons), and a certain reduction is expected in it in subsequent years. Coal production lately has been constantly decreasing and by 1985 was 92 million tons. This is connected with the exhaustion of fields being worked and closure of a number of unprofitable mines. Despite available reserves of iron ore, its production has practically ceased. Ferrous metallurgy enterprises operate with imported ore having a high content of the useful component.

The country holds sixth place in the capitalist world and third in Western Europe in the production of electrical energy (270.6 billion kw·hours in 1985). Around three-fourths of it is produced at thermal electric power stations. Atomic electric power stations account for 22 percent and hydroelectric stations around 2 percent of the production of electrical energy.

The largest thermal electric power stations are Isle-of-Green (2.6 million kw), Drax (2.6 million, (Fig. 2 [figure not reproduced]), and Ferrybridge (2.4 million). Of the 14 operating atomic electric power stations the greatest capacities are in the Dungeness (1.6 million kw), Hinkley Point (1.5 million) and Hartlepool (1.3 million). In recent years the country has begun building large hydroelectric pumped storage power plants. The first of them, Dynoruik, with a capacity of 1.25 million kw, was placed in operation in 1983.

The processing industry is the leading sector of the British economy. It creates more than a fourth of the GNP and employs 5.5 million persons. Its most important sectors include machine building (around 19 percent of the overall production volume of the processing industry), the electrical equipment industry, electronics industry and instrument making (almost 16 percent), chemical (over 10 percent) and automobile industry (around 5 percent), metallurgy (almost 4 percent), oil refining industry (2 percent) and others.

The main machine building products are mining, hoisting and transport, and construction equipment, compressors and machine tools. The latest direction in the sector is robot making. Great Britain occupies sixth place in the world in the number of functioning robots. Sector enterprises are concentrated in the cities of London, Birmingham, Manchester and Coventry.

The electrical equipment industry, electronics industry and instrument making are among the most dynamically developing sectors. They specialize in the production of generators and electric motors, storage batteries, electronic components, computers, control systems, and laser and electro-optical equipment. The leading firms are General Electric, AB Electric Production Group, Ferranti, Marconi, Plessey and Decca. Their enterprises are directly connected with military production and are concentrated in the cities of London, Bristol, Birmingham, Manchester and Dundee.

The country's chemical industry produces plastics, petrochemical products, pharmaceutical goods, and mineral fertilizers. These products are in demand in the international market. They account for around 20 percent of the processing industry's export volume. Leading positions in the sector are held by Imperial Chemical Industries, Shell Chemical and BP Chemical. The cities of Birmingham, Middlesbrough, Manchester and London are the most important production centers.

British automobile making has been experiencing great difficulties for several years now. A drop in demand for British-made automobiles on the foreign and domestic markets led to a drop in loading of capacities from 60 to 35 percent. Enterprises of the leading automobile making firms—British Leyland, Ford, Vauxhall and Talbot—are located in the cities of London, Coventry, Luton and Leyland.

The foundation of the ferrous metallurgy production base is made up by five combines with a full metallurgical cycle and 28 steel plants with a total capacity of around 15 million tons of cast iron and 25 million tons of steel a year. Almost 70 percent of capacities belong to the state company of British Steel. As a result of a lengthy crisis, production capacities dropped by almost a fourth in the period from 1970 through 1984 and steel production dropped by more than half. Loading of capacities has not exceeded 60 percent in recent years. Sector enterprises are concentrated in Yorkshire and Humberside (33 percent of steel smelted in the country), Wales (32), the Northern Economic Region (18) and Scotland (12).

Nonferrous metallurgy's requirements for raw materials basically are met through import. A lag in the production of aluminum, copper and zinc from their consumption level is typical of the sector. The production of nonferrous metals from secondary raw materials increased in recent years. The principal centers of nonferrous metallurgy are the cities of Lynmouth (over 40 percent of the primary aluminum), Walsall (over 40 percent of refined copper), North Ferriby (100 percent of tin), Clydagh (100 percent of refined nickel and cobalt), and Shotton (100 percent of sponge titanium).

The country has 16 oil refineries, capacities of which are over 95 million tons a year for straight-run refining of oil. Their loading does not exceed 80 percent. Some 4 percent of oil products consumed in the country goes for the needs of the armed forces. The main oil refineries are concentrated east of London, in southwestern Wales, and in the city of South Killingholme.

Shipbuilding continues to experience great difficulty. Yard capacities have been loaded by only a third for a number of years. Leading positions in the sector are held by the state corporation of British Shipbuilders. The largest shipbuilding and ship repair centers are the cities of Barrow-in-Furness, Newcastle-upon-Tyne, Middlesbrough, Glasgow and Liverpool.

Great Britain's **military industry** has a large scientific-production base which permits almost total satisfaction of armed forces' needs. Around 10,000 state and private companies engage in the manufacture of military products.

Great Britain takes an active part in almost all major programs being carried out by European states in NATO. A significant portion of arms being created goes for export, where the country holds third place in the capitalist world after the United States and France in volume of arms export. According to foreign press data, 1986 British weapon deliveries were worth 2.8 billion pounds sterling, which was around 10 percent of all arms exports of capitalist states.

The principal producers of aircraft and missile equipment(1) are the firms of British Aerospace, Short Brothers, Britten-Norman, Westland Helicopters, Rolls-Royce, Marconi, EMI and others. These companies' enterprises produce the Tornado tactical fighters, Jaguar fighter-bombers, Harrier attack aircraft, Lynx and Westland helicopters, Skyflash and Seawolf guided missiles, Swingfire and Milan antitank guided missiles, and the Rapier and Blowpipe surface-to-air guided missiles. Plants are located in the cities of Bristol, Dunsfold, Derby, Yeovil, Stevninge, Warton, Wyebridge, Hatfield and others (Fig. 3 [figure not reproduced]).

The principal companies engaged in producing combatant ships include British Shipbuilders, Vickers Shipbuilding and Engineering, Vosper Thornycroft and Yarrow Shipbuilders. They build nuclear and diesel submarines, guided missile destroyers, guided missile frigates (Fig. 4 [figure not reproduced]), minesweepers, air cushion vehicles and guided missile patrol boats. The leading shipyards are in the cities of Barrow-in-Furness, Belfast, Glasgow, Newcastle-upon-Tyne, Plymouth and Southampton.

The armored industry(2) presently manufactures the Challenger and Scorpion tanks, Saxon wheeled APC's and other equipment. Deliveries of MCV-80 infantry fighting vehicles have begun. The production base for manufacture of armored equipment is concentrated in enterprises of private firms and state tank plants in the cities of Leeds, Newcastle-upon-Tyne, Coventry and Telford.

Production of nuclear ammunition for artillery systems, mortars, antitank rocket launchers, various small arms, ammunition and explosives has been organized in the country.

Agriculture is distinguished by high intensity and plays an important role in the economy. Some 1.6 percent of the gainfully employed population is engaged in it and it accounts for 2.3 percent of the GNP. The country produces over half of the agricultural products consumed by the population. Needs for barley, wheat, oats, potatoes, poultry, eggs and fresh milk are fully met.

Crop production and animal husbandry provide 35 and 50 percent respectively of the value of agricultural products. The average annual grain harvest is 21-26 million tons, of which there are 10-15 million tons of wheat, 10-11 million tons of barley and 500,000 tons of oats. The bulk of arable land is situated in eastern areas, while animal farms are established primarily in the moister western part of the country. There are over 13 million head of cattle, almost 35 million head of sheep, some 8 million pigs and 129 million poultry.

All kinds of **transport** are developed in Great Britain. The volume of domestic freight shipments exceeds 1.7 billion tons a year. The bulk of freight (over 80 percent) is shipped by motor transport; rail transport accounts for less than 8 percent, and this proportion is constantly dropping. Pipeline transport (5 percent of the volume of shipments) stands out among other kinds of transport. The role of river and air transport in domestic freight movements is slight. Container shipments have been widely introduced in all kinds of transport. Great Britain holds second place in the capitalist world (after the United States) in their number (300,000 units).

The length of all highways in the country in 1985 was 345,000 km and their density was around 150 km per 100 km^2 (Fig. 5 [figure not reproduced]). The motor vehicle fleet numbers 20.2 million vehicles, including 17.6 million passenger vehicles. The total length of railroads approaches 17,200 km, including almost 4,000 km electrified. There is a high proportion of double-track and multitrack railroads (around 75 percent of the entire railroad network). Rolling stock consists of 3,000 locomotives, 95,000 freight cars and 20,000 passenger cars.

Air transport is used primarily for passenger transportation. The aircraft inventory numbers over 500 aircraft and 700 helicopters. The largest airports, Gatwick and Heathrow (both in the London suburbs), have a yearly throughput capacity of 11 and 27 million persons respectively.

Pipeline transport saw development in the latter half of the 1970's in connection with active development of oilfields in the North Sea. The length of oil pipelines is over 4,000 km including 1,500 km of marine oil pipelines over which some 80 percent of oil produced in the British sector of the North Sea is pumped. The length of natural gas pipelines is 7,900 km, of which 2,100 km represent the length of underwater pipelines. Domestic water transport is developed relatively poorly; it carries some 5 million tons of freight, basically construction materials, coal, iron ore and oil products. The River Thames is the main water route (over 60 percent of the total volume of freight movements).

Marine transport holds a special place in the country's economy, accounting for 98 percent of foreign trade shipments (250 million tons a year). They are distinguished from similar shipments of other capitalist countries by the high degree of support with its own fleet. Great Britain holds third place among capitalist states, behind Japan and the United States, in volume of coasting shipments. Overall tonnage of the merchant fleet (vessels with a gross register tonnage of 100 or more) is 11.6 million register tons. The fleet includes over 2,250 vessels, more than half of which are tankers and containerships. The country has 28 ports each with a freight turnover of over one million tons per year, and a total of more than 300 seaports with a cumulative freight turnover of 420 million tons. The largest of them are London and Middlesbrough (64 million tons each), Milford Haven (42 million), Southampton (24 million), Immingham (23 million), Liverpool (14 million), Manchester (13 million), and Clyde (12 million).

The **armed forces** consist of ground, air and naval forces and reserve components. According to foreign press announcements, the size of the regular armed forces is 325,500 persons, including 161,500 ground forces, 93,500 air forces and 70,500 naval forces. There are over 305,000 persons in various categories of the reserve.

A Cabinet of Ministers and a Defence Committee headed by the prime minister develop fundamental directions of military policy. The Defence Ministry is responsible for organizational development and status of the armed forces and for implementing decisions of the

Cabinet of Ministers and Defence Committee. A defence staff is the principal organ of immediate command and control of the armed forces.

The armed forces are divided according to specific purpose into strategic nuclear forces and general purpose forces. Four nuclear-powered missile submarines are assigned to the former. The remaining units of branches of the armed forces belong to the general purpose forces, which also have nuclear weapon delivery means. The latter are in the inventory of the 1st Army Corps (stationed in the FRG).

The armed forces are manned on a voluntary basis by persons in ages from 17.5 to 30 years (in the Navy up to 33 years).

The *ground forces*(3) are the largest branch of the armed forces and are intended for conducting combat actions in coordination with the Air Force and Navy as well as within the NATO OVS [Joint Armed Forces] in Europe. They include regular and territorial troops. The regular troops have three armored divisions, one motorized infantry division, 14 separate motorized infantry brigades, one airborne brigade, and separate units and subunits. Organizationally the ground forces are placed in army commands on the territory of Great Britain and in the FRG (the British Army of the Rhein) and in small troop contingents in other parts of the world.

According to western press data, the ground forces have 12 Lance guided missile launchers, some 1,300 tanks, over 500 field artillery pieces, 450 mortars, antitank weapons and air defense weapons. Army aviation has around 300 helicopters.

The primary mission of the *Air Force*(4) is to provide air support to ground and naval forces both of their own country and of North Atlantic Alliance allies. They have three commands: the Air Force in Great Britain, the British Air Force in the FRG, and a rear.

The air force command in Great Britain (headquarters at High Wycombe) is included in the structure of the North Atlantic Alliance and is subordinated to the CIC of NATO Joint Armed Forces in Europe. It includes three air groups as well as separate units and subunits based on overseas territories. The command authority of the British Air Force in the FRG (headquarters at Rheindahlen) has 11 tactical air squadrons, one squadron of communications aircraft, two squadrons of transport helicopters and four squadrons of Rapier surface-to-air guided missiles. The command authority of the Air Force rear accomplishes missions of logistical support of Air Force units and subunits, organizes communications, and supports the training of flight and technical personnel.

Judging from foreign press reports, the British Air Force has an inventory of over 630 combat aircraft such as the latest Tornado-GR.1 tactical fighters and Tornado-F.2A air defense fighters (a total of around 200), over 120 Phantom multirole tactical fighters, almost 120 Jaguar fighter-bombers, Harrier V/STOL fighters as well as other aviation equipment.

The *Navy* consists of the fleet, naval aviation and marines. Organizationally it includes five commands: Fleet, Naval Home Command, Naval Air Command, Marine Command and Training Command as well as the Gibraltar Naval Area.

The Fleet Command has submarine forces, three flotillas of surface ships, one flotilla of minesweeping forces as well as separate ships and auxiliary vessels subordinate to it. The Naval Home Command includes all shore facilities, training centers, some auxiliary vessels, the naval ship reserve, as well as naval areas. The Naval Air Command includes squadrons of fighter-attack aircraft, ASW helicopters, assault transport helicopters and auxiliary aviation. The Marine Command consists of a marine brigade and separate units and subunits. The training command organizes manning and training of crews. According to foreign press data, the navy has around 170 combatant ships: 34 submarines (4 nuclear-powered missile, 15 nuclear-powered and 15 diesel), 3 antisubmarine carriers, 14 guided missile destroyers, some 40 frigates (including 27 guided missile frigates) and others. There are also over 220 auxiliary vessels and patrol boats. In an emergency period it is planned to strengthen naval forces by bringing in and refitting civilian vessels.

Work is under way on a qualitative improvement of the ship inventory. The press has reported a decision to make the new Trident-2 sea-based nuclear missile system operational by the mid-1990's.

The U.S. and NATO commands attach great importance to the territory of Great Britain. It is viewed as an important support base for conducting combat actions in the Atlantic and as a rear base of NATO armed forces in Europe. The Pentagon alone maintains over 130 military installations in the British Isles, and nuclear weapons are stationed at some of them.

Footnotes

1. For more detail about the aircraft and missile industry see *Zarubezhnoye voyennoye obozreniye,* No 7, 1985, pp 51-57—Ed.

2. Regarding the production of armored equipment see *Zarubezhnoye voyennoye obozreniye,* No 2, 1986, pp 77-83—Ed.

3. For more detail on them see *Zarubezhnoye voyennoye obozreniye,* No 10, 1985, pp 27-33—Ed.

4. For more detail on them see *Zarubezhnoye voyennoye obozreniye,* No 3, 1987, pp 33-39—Ed.

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U.S.-FRG X-31A Aircraft

18010022l Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 8, Aug 87 (signed to press 6 Aug 87) pp 77-78

[Article by Col N. Nikolayev: "American-West German Experimental Aircraft"]

[Text] Development of future tactical fighters, the American ATF and European EFA, holds a substantial place in the arms race unleashed by the United States and other NATO bloc countries. In addition to theoretical calculations, design work and wind tunnel research, individual engineering solutions for these fighters are being checked during flight tests of specially built experimental aircraft including the X-29, AFTI/F-16, AFTI/F-111, F-15 STOL, EAP, Rafale, as well as the X-31A created jointly by the United States and the FRG. Judging from foreign press reports, the X-31A is intended chiefly for flight tests of problems connected with the fighter's high maneuverability in close air combat at slow, transonic and supersonic flight speeds and in operation against ground targets.

The defense ministries of the United States and FRG signed an agreement in June 1986 for joint development of the X-31A. Taking part in the aircraft's creation on the American side are the firms of Rockwell (prime contractor), General Electric and Aerospace Business Group (subcontractors), and on the West German side Messerschmitt-Boelkow-Blohm (MBB). The American firms are responsible for around 80 percent of the work, including choice of the aircraft's aerodynamic configuration and design of its airframe, power plant and a number of systems, and MBB is responsible for flight control and thrust-vector control systems.

It is planned to develop the X-31A in three stages. A concept feasibility study already was performed during the first stage (lasting 12 months), and designing is being done during the second stage (July 1986 to September 1987). The third stage (October 1987 to April 1989) covered the building of two models. The flight test program is designed for one year and is to begin in the fourth quarter of 1989.

According to preliminary designs the X-31A is a single-seat delta-wing monoplane with variable sweep on the leading edge, forward control surfaces, without a horizontal tail unit, with one vertical stabilizer with rudder, and tricycle nose-wheel undercarriage. The power plant will consist of one F404 General Electric turbofan engine with 7,250 kg(f) thrust in afterburning. The engine air intake is located beneath the fuselage.

It is planned to achieve high maneuverability and controllability of the X-31A by using forward control surfaces which create a natural static instability at slow flight speeds, elevons along the full span of the wing's trailing edge, maneuverable leading edge slats, two-dimensional jet nozzle with variable thrust vector, a flight control system integral with the engine control and thrust-vector control system, and subsequently also with a weapon control system. It is also considered necessary for the flight control system to provide automatic and artificial stability both in ordinary flight and in flights at angles of incidence beyond stalling, and for the pilot's cockpit to be so configured that he can withstand large linear and angular accelerations.

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Foreign Military Chronicle

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[Text] **United States**

*Around 30 percent of U.S. Air Force strategic B-52 and FB-111 bombers are kept in constant readiness for an operational flight.

*Another contract was signed with General Dynamics (Convair Division) for $158 million for deliveries of 125 sea-based Tomahawk cruise missiles and 26 land-based cruise missiles to the U.S. Navy. The American Navy began receiving cruise missiles of various modifications in the inventory in 1983.

*An exercise of the 101st Air Assault Division was held during February-March of this year under the codename "Golden Eagle." The following problems were practiced: movement of units and subunits up to concentration and assault transport helicopter boarding areas, movement of personnel and combat equipment to the combat zone, coordination with supporting tactical air subunits and other problems. In the American command's assessment, the exercise was the division's largest since 1976.

*Lockheed developed a set of individual protection gear for the C-130 Hercules military transport aircraft. It consists of the AN/ALR-69 warning receiver, AN/ALQ-156 missile warning radar, and the AN/ALE-40 chaff and IR decoy dispenser. This set can be installed aboard the aircraft by a team of four persons in 8 hours.

*A contract was concluded with Texas Instruments for production of 2,300 AGM-88A HARM antiradar guided missiles for U.S. Naval Aviation. It is planned to begin delivering them in 1988.

*The nuclear carrier CVN 69 "Dwight D. Eisenhower" was placed in the Atlantic Fleet order of battle after completion of major overhaul and modernization in April 1987. The work, which lasted a half-year, cost $337 million.

*Repair and modernization of the "Forrestal" Class carrier CV 62 "Independence" under the SLEP program is concluding (work began in April 1985). She is expected to be transferred to the fleet in January 1988. The ship was commissioned in the Navy in January 1959. It is reported that the modernization should extend her life by another 15 years. Two ships of this class—the CV 60 "Saratoga" (1980-1983) and CV 59 "Forrestal" (1983-1985)—already have undergone similar repair and modernization under this program and a fourth, the CV 61 "Ranger," is to be put up in the yard in July 1993.

*The length of the SURTASS system towed sonar antenna with which "Stalwart" Class sonar surveillance ships are equipped reaches 1,800 m.

*A decision has been made to build an enterprise in Macon, Georgia for putting together individual assemblies for the new C-17 military transport aircraft. The enterprise will be located near the airport and its production spaces will have an area of 14,000 m^2. Construction will begin in 1988 and the output of finished products will begin in 1989.

Great Britain

*Deliveries to the ground forces of the Wavell automatic control system equipment created by the firm of Plessey have ended. Its components are deployed at the command posts of corps, divisions, tactical groups and communications centers. System equipment is accommodated in vehicles and tracked APC's (a total of 32 such vehicles were received by the troops). The total cost of the development and production program of the Wavell automatic control system is 80 million pounds sterling.

*The first Tucano series-built trainer aircraft has been built under Brazilian license. A total of 130 such aircraft have been ordered for the country's Air Force. It is reported that the flying life of the airframe of Tucano aircraft manufactured by the British firm of Short Brothers will be almost 50 percent greater than for the base model.

*The Seawolf surface-to-air missile system with new Type 911 fire control radar underwent tests aboard the guided missile frigate "Brave." The radar, which simultaneously tracks target and missile, has two control channels: one for long-range high-flying targets and the other for close range against low-altitude targets.

FRG

*Prototypes have been created of a modernized version of the American M44 155-mm self-propelled howitzer. A 450 hp diesel engine has been installed to replace the carburetor engine (range increased from 130 to 600 km). The gun portion was taken from the FH70 towed howitzer (maximum range of fire with conventional fragmentation-high explosive projectile is 24 km, and with rocket-assisted projectile it is 30 km). The unit of fire is 30 rounds. Running gear suspension also was improved on the howitzer and a new track is being used.

France

*A 105-mm towed gun was developed by the GIAT industrial association which is planned to replace some of the obsolete M101 (American) and M56 (Italian) 105-mm howitzers in the ground force inventory. Maximum range of fire with the new gun with conventional fragmentation-high explosive projectile approaches 15 km. The gun weighs 1.25 tons and has a crew of six.

*Creation of a prototype of the Storm shipboard multiple launch rocket system loaded with 36 160-mm free-flight rockets is concluding. The rocket weighs 110 kg (explosives weigh 50 kg) and the range of fire is 30 km. It is planned for installation aboard medium-displacement combatant ships and for employment in fire support of an assault landing.

Italy

*The ST-AT/V pull-type minelayer has been created for laying antitank mines in the soil or on the surface of the ground. The minelayer is mounted on a single-axle trailer and towed by a tracked APC on which the mines are carried.

*It is planned to produce the Naros shipborne multiple launch rocket system in three versions: 40 122-mm (range of fire 25 km), 30 81-mm (12 km), and 48 50-mm (6 km) free-flight rockets.

Belgium

*The first squadron for security and defense of air force ground installations has been activated with a strength of 184 persons. The squadron is assigned to Melsbroek Air Base where the 15th Air Wing is stationed. It has missions of protecting aviation equipment, communications centers, the command post and other base installations. Subsequently it is planned to attach one such squadron to each air wing.

Norway

*The lead Type 210 submarine S300 "Ula" for the Norwegian Navy was laid down in January 1987 at the yard of the West German Thyssen-Nordseewerke company in the city of Emden. It is planned to build six submarines. The S300 "Ula" is to be transferred to the Navy in February 1989 and the others (S301-305) at

six-month intervals from April 1990 through April 1992. The principal tactical and engineering characteristics are 1,300 tons submerged displacement, length of 59 m, beam of 5.4 m, draft of 4.6 m, submerged speed of 23 knots (surface speed of 11 knots), and armament of eight 533-mm bow torpedo tubes (unit of fire of 14 torpedoes). The crew is around 20 persons.

Spain

*Appointed:

—Division General A. Vicente as commander of the Navarra 6th Mountain Rifle Division (headquarters in Pamplona);

—Brigadier General L. Arriba as commander of a separate airborne brigade (La Coruna).

*Delivery has begun from Great Britain of Searchwater long-range surveillance radars for ship-based SH-3D Sea King helicopters.

Portugal

*Twenty-four French TB.30 Epsilon trainer aircraft have been ordered for the country's Air Force to replace the obsolete Canadian-made Chipmunk aircraft.

Greece

*An agreement was reached between the Greek firm of Hellenic Aerospace Industries and the American firm of Northrop on joint development and production of the Telamon reconnaissance drone. It is to be created on the basis of the American BQM-74C Chukar-III drone by outfitting it with new reconnaissance gear including a panoramic AFA [aerial photo camera] and television camera. The Telamon's flight speed will be around 900 km/hr and maximum range will be 700 km. It is to be launched from a ground or shipboard launcher as well as from a mother aircraft.

NATO

*Cumulative military expenditures of bloc member countries reached $369 billion in 1985 (5.4 percent of their overall gross national product). Of this, 25.7 percent was spent for the acquisition of new weapons and military equipment. The strength of armed forces of the aggressive bloc's states was 5,667,000 (2.8 percent of the overall size of their able-bodied population).

*NATO specialists believe that there must be annual financing of at least $1.2 billion to keep Turkey's armed forces in combat readiness corresponding to requirements of this bloc's command authority. Based on this, Turkish Prime Minister T. Ozal requested that the American administration increase military assistance to the amount indicated beginning in 1987.

*The Turkish defense ministry concluded a contract worth some $19 million with the firm Marconi Italiana for delivery of modern equipment for tactical communication systems. Funding for the contract will come from NATO.

Sweden

*In the opinion of western specialists, the first flight of the new JAS-39 Grippen fighter will be no earlier than the end of this year, i.e., with a six-month delay caused by an increase in development time for a large number of aircraft systems including the airborne radar, remote electronic control system and power plant. It is planned to begin series production of the fighter in the early 1990's.

Saudi Arabia

*The country's 1987 state budget was announced. Its largest item is "defense and security," with 60.8 billion riyals ($16.2 billion), 35.8 percent of all budget expenditures, allocated for these purposes.

Japan

*The draft state budget for fiscal year 1987 (beginning 1 April) has been approved. Military expenditures were set in the amount of 3.5 trillion yen ($22 billion), which is 5.2 percent more than last year, and for the first time they exceeded the limitation established in 1976 of 1 percent of the gross national product. It was in 1986 that Japan moved into fourth place in the capitalist world in the level of military appropriations behind only the United States, Great Britain and the FRG.

*The guided missile destroyer DD 131 "Setoyuki," the tenth ship of the "Hatsuyuki" Class, was transferred to the Navy. It became part of the 42d Division, 2d Destroyer Flotilla (Sasebo Naval Base).

The 45th Guided Missile Destroyer Division was formed (DD 132 "Asayuki" and DD 133 "Shimayuki") as part of the 3d Destroyer Flotilla (Sasebo Naval Base). The Flotilla's 21st Division (DD 113 "Yamagumo," DD 114 "Makigumo" and DD 115 "Asagumo") was transferred to the Sasebo Naval Area. The 11th Separate Division of this Naval Area was disbanded (DD 112 "Makinami" and DD 111 "Oonami").

New Zealand

*The United States has taken one further step to pressure the New Zealand government in connection with the ban it instituted on calls on the country's ports by foreign ships with nuclear weapons aboard. The United States decided not to renew the force of the 1982 agreement on logistical support of New Zealand's armed forces which expired in June of this year. For New Zealand this means

an increase in prices on equipment, spare parts and other supply items, an increase in their delivery times and the need to establish additional depots.

Egypt

*The Egyptian Air Force has received the first two E-2C Hawkeye AWACS aircraft (five were ordered). They were ferried from the United States to Cairo (West) Air Base in February 1987. The Air Force was supplied with some 60 American F-16 Fighting Falcon tactical fighters by the beginning of spring. A total of 80 such aircraft was ordered and it is planned to purchase another 40 in the future.

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